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No. 3—The Control of Tuberculosis by means of the Tuberculin Test*

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In dealing with this subject it appears that some consideration must first be given to the tuberculin test itself, as its use in the control of tuberculosis can only be justified by confidence in its reliability which, in turn, will depend on the methods of application and the interpretation of results. In recent years circumstances have limited me to the use of the double intradermal test and accordingly this discussion will be confined to a consideration of that test.

As a field worker with few opportunities for *post-mortem* examination of reactors, and still less for more detailed examination by laboratory methods, my judgment on the reliability of the test must necessarily be based on the results obtained from its use in numerous herds tested regularly over a period of years, and on this basis I am satisfied that it is reliable and will detect the infected animals. It is admitted that at times no lesions may be found in reactors, but the absence of the converse—finding lesions in non-reactors—is much more important in the eradication of the disease from a herd.

Since synthetic medium tuberculin was approved for use in the testing of herds licensed under the Milk (Special Designations) Order, I have used no other type of tuberculin and am satisfied that, compared with "old tuberculin," it produces equally definite reactions in infected animals and gives fewer doubtful results.

Briefly, the technique I employ is as follows: an area about 3 inches square on the side of the neck is clipped and a clip mark is made with scissors in the centre to indicate the site of the injection. Without cleansing or disinfecting the skin or measuring the fold of skin and using a "21" needle about 6 mm. long, I insert the full length of the needle into the skin at an angle of about 15 to 20 degrees. In animals with thick spongy hides, like bulls and some heifers, the tuberculin should be injected no deeper than into the skin of average thickness.

At the 48th hour two measurements are made; firstly, of the normal skin adjoining the site of injection and secondly, of the swelling resulting from the first injection. In a non-reactor the first injection usually results in a well-defined nodule with an increase in the thickness of the skin of 1 or 2 mm., though in a small percentage of animals the injection produces what can best be described as a thickening of the skin which can be felt over an area of about an inch in diameter and showing a similar increase in measurement to the typical nodule. Except in a few old cows this thickening does not persist after the second injection.

At the 48th hour there is usually little doubt as to the final result of the test; one rarely meets with an animal, which finally proves to be a reactor, which does not show some abnormality in the size and character of the swelling at the 48th hour.

Having made the measurements and noted the character of the swelling, all animals, not definite reactors to the first dose, are given a second injection and the final observation is made 24 hours later, when the swelling is again measured and its character noted.

In the non-reactor the swelling is firm, circumscribed, round or oval in shape and measures about 3 mm. more than the pre-injection measurement. The increase in measurement varies but little, 3 mm. is much the most frequent increase noted, while 2 mm. is more frequently met with than 4 mm., and an increase of more than 4 mm. will, in most cases, raise doubts in one's mind as to the result.

In the reactor the swelling varies considerably in size and character. The most frequently observed type of swelling in a reactor is one measuring 20 to 25 mm., oval in shape, slightly oedematous and feeling attached to the underlying tissues. Not infrequently much larger swellings are met with measuring up to 50 mm. or even more, while at the other end of the scale is the plaque type of reaction where the fold of skin may only measure 3 or 4 mm. more than the pre-injection measurement, though there is

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a flat, oval or pear-shaped, oedematous swelling from 35 to 50 mm. in diameter. While I am of opinion that practically all marked variations from the firm, typical circumscribed nodule of the non-reactor must be considered reactors, there is one type of swelling which I regard as doubtful, *viz.*, a firm, well-defined nodule measuring from 12 to 15 mm. in the average skin with little or no oedema. Further reference will be made later to these doubtful reactors.

Pain should be given little weight as the deciding factor in the doubtful reactor as many non-reactors, particularly if frequently tested, will flinch whenever the skin is touched. Other evidence that an animal is a reactor may be found in the enlargement of the prescapular lymphatic gland, while systemic disturbance, rigors and a high temperature, may be observed at times and a definite drop in milk yield is not infrequent.

It has been stated that some animals showing no reaction at the 72nd hour, show such a swelling on the following day as to justify their being called reactors ; no such animal has come to my notice though a number of herds have been re-examined on the fourth day and, if such delayed reactions do occur, they must be of such rare occurrence that a further visit on the fourth day does not seem called for. A further observation on the fourth day is, however, of value in the case of a doubtful reactor, as the swelling in a reactor subsides less rapidly than in a non-reactor.

A number of *post-mortem* examinations have been made in an endeavour to ascertain the possible relationship between the type of reaction and the degree of infection ; though the number of examinations made is insufficient to justify definite conclusions, the indications appear to be that the large reaction occurs in the actively progressive case, while the more chronic and older cases give a smaller swelling.

With regard to the animal giving an indefinite result, I have frequently re-tested such animals immediately on the conclusion of the test and have got such a difference in the result of the re-test as to justify the formation of a definite opinion. This re-test may be done on the opposite side of the neck, but there is seemingly no advantage in doing so. Apparently the first test in no way interferes with its re-application, though whether this would hold good with frequently repeated tests I have had no experience to justify an expression of opinion.

Instead of using the neck as the site of the re-test I frequently use the labium of the vulva. It has been my practice to use this site when, a the 48th hour, a slightly abnormal swelling is observed on the neck, since the vulva reaction can then be observed at the final visit 24 hours later. A positive reaction in the vulva is much more diffuse than on the neck, the whole labium is tumefied and the mucous membrane intensely congested.

To replace the broth formerly used as a control with " old tuberculin " a control fluid is available for use with the synthetic medium tuberculin. I have tried this fluid on a number of animals of all classes, but my experience has not been such as to lead me to continue its use as a control ; in no case have I been able to obtain a swelling closely resembling that obtained in many animals which were definitely non-reactors. In every case, using the same dose, the control fluid gave a much smaller " pea " than did the tuberculin.

It will be generally acknowledged that the character of the swelling is of much greater importance than its size in determining the result of the test, and this being so, it might be argued that measurements are unnecessary, but some record of the test is desirable and, while the record at present employed is so far satisfactory, it seems to me that the area of the swelling might give a better indication of the result than the thickness of the fold of skin at the site of the injection. Though measuring the area is not so simple as measuring the thickness of the fold of skin, it would convey much more to anyone reading the report of the test to read that the animal showed an oedematous swelling measuring 50 mm. by 35 mm. than to be informed that the fold of skin measured 7 mm. before injection and 13 mm. at the 72nd hour with oedema. For this method to be adopted the maximum area of the swelling in a non-reactor would have to be agreed upon, but by this method only one measurement would be necessary.

With the present method, I would suggest that it is unnecessary to make any measurement at the 48th hour unless the reaction is then such that no second dose is to be given. I have never seen an animal giving a negative result at the 72nd hour which had given such a swelling at the 48th hour as would have justified a different opinion and I submit that an adequate record of the test would be afforded by the pre-injection measurement and the final measurement with the character of the swelling whether that be at the 48th or 72nd hour.

With regard to the " doubtful " reactors previously mentioned, these are not of frequent occurrence, but the occasional discovery of such animals in herds believed to be free from tuberculosis is difficult to explain. In an infected herd many of these animals would probably be classed as atypical reactors, but in herds showing no reactors for years such animals can only be classed as doubtfuls, in view of the fact that some of them subsequently do not react and the rest of the herd remains free. I have had no opportunity to make a *post-mortem* examination of any of these doubt-

ful cases, but the measurements and characters of these swellings and the results of re-tests so closely resemble the cases quoted by Robertson and Hole in their article in the *Journal of Comparative Pathology and Therapeutics* of March last, that there is no doubt in my mind that what I have described as "doubtful reactors" are their "skin-lesion tuberculin-reactors."

These cases have been found more frequently within the last two years in Ayrshire than formerly, and the majority of our cases have been met with in young stock, though it is noticed that only two of Robertson and Hole's twelve cases were heifers, while two others were three-year-old cows.

Prior to the introduction of the Tuberculosis (Attested Herds) Scheme and the Milk (Special Designations) Order (Scotland), 1936 it had been our practice to test only the cows and in-calf heifers in most of the licensed herds, and such doubtful reactors were rarely met with and certainly had not been recognised as a separate type of reaction. It seemed that here was some type of infection affecting mainly young cattle which in later life produced no reaction and certainly showed no evidence of spreading to in-contact animals. Re-testing with avian tuberculin in the majority of cases produced a slightly more definite reaction, in the form of a larger swelling and more oedema. Did this indicate that these animals were suffering from avian tuberculosis? Certainly in practically every one of my cases they had been in contact with poultry, but whether the poultry were infected had not been ascertained.

In February last the Department of Agriculture for Scotland called the attention of owners of attested herds to the danger to tubercle-free herds from tuberculosis in poultry and stated—"It has become clear from experience of testing cattle with tuberculin under the Attested Herds Scheme that a number of reactions to the test are due to infection with avian tuberculosis from poultry."

It has been of interest to note how rarely does this type of reactor give a second doubtful or positive result, even when re-tested at short intervals. I have noted two animals which were negative to synthetic tuberculin on a re-test ten days after being "doubtful positives" while giving fairly definite reactions to avian tuberculin. It will be observed that Robertson and Hole only made seven of their 16 re-tests with synthetic tuberculin more than three weeks after their first doubtful or positive result and of these seven, not one gave a positive result. Does this experience mean that the capacity to produce this type of doubtful or positive reaction is of a temporary character, or is it that one dose of tuberculin very largely negatives repeated reactions?

In speculating as to the true nature, etc., of these reactions there comes to mind a dictum from a "thriller" I read recently—"inadequate knowledge usually leads to false explanations of observed phenomena," and in the present state of our knowledge such animals can only be considered as reactors and eliminated from the herds, as there appears to be no means whereby they can be differentiated from atypical reactions due to true bovine tuberculosis infection, even assuming that there is no risk of any spread of infection and that there is a good chance that later on the animals will no longer react.

In the second section of the paper I propose to limit myself to discussing the measures to be taken in eradicating tuberculosis from the individual herd by the use of tuberculin and not to discuss again the much wider national problem of general eradication.

The first step must obviously be the testing of all bovine animals on the premises with segregation of the reactors as soon as possible and disinfection of the premises to be occupied by the non-reactors. Thoroughly effective disinfection of some buildings is difficult to carry out, but the benefit to be derived will fully compensate for the labour and expense involved. Too often have reactors appeared at subsequent tests as the result of ineffective disinfection, while on the other hand we have had quite a number of previously badly infected premises restocked after disinfection without mishap, when the disinfection has been thoroughly done.

In regrouping the non-reactors, those formerly standing beside reactors should be grouped together as far as possible. These animals have been more liable than the others to have been exposed to infection from their reacting neighbours and therefore are more likely than the others to be reactors on a re-test, so that, by grouping them together, it should be possible to limit any spread of infection to this group. This re-grouping seems to me to be of special importance as some animals on becoming infected apparently very soon become capable of spreading the disease.

The next step is the protection of the non-reactors from possible sources of infection; the most important probable sources of infection have already been dealt with in the segregation of the reactors and the disinfection of the premises, but other possible sources must be considered. Neighbouring infected herds can be dealt with by double fencing and sound gates, though straying cattle are a possible danger which cannot always be guarded against even with double fencing. Water supplies sometimes present a more difficult problem as it is not always possible to fence off streams and ditches and provide water troughs on the grazings, but this appears to be essential in particular cases if a free herd is to be maintained.

Manure from an infected herd should not be spread on the grazing of the clean section of the herd nor, if possible, should pastures formerly grazed by infected stock be occupied by free stock for at least six months. Pigs are always a possible source of re-infection, and where contact between the cattle and swine is unavoidable the latter should be regularly tuberculin tested and, likewise, untested poultry should be kept separate as far as practicable from the free cattle. And what of the risk from tuberculous attendants? Only on one occasion have I had any reason to suspect that tuberculosis in bovines was of human origin; this was a case of tuberculosis of the udder, in which no lesions were found elsewhere than in the udder and some months previously a milker had been found to be an open case of tuberculosis.

If animals are purchased to replace reactors, these should be obtained from free herds and the date of their last test should be ascertained so that too long a period may not elapse before they are re-tested; but if cattle are not directly obtainable from free herds the purchased animals should be tested immediately, isolated for three months and re-tested before being added to the herd. While the 60 days' isolation required under the Tuberculosis (Attested Herds) Scheme and the Milk (Special Designations) Orders should be sufficient in most instances, it may not be so in all cases and even the three months suggested here may be insufficient. It has to be recognised, however, that longer isolation is not usually practicable.

In transporting cattle special attention must be paid to the disinfection of the vehicle used. Cattle floats, despite the provisions of the Transit of Animals (Amendment) Order of 1931, have been found to be a fruitful source of re-infection of free herds.

The non-reacting section of the herd should be re-tested at intervals of about three months, so that animals which have become infected may be recognised and removed as early as practicable. Having had two successive tests with no reactors, an interval of six months may be allowed between the tests and after two six-monthly tests with no reactors an annual test should normally suffice to maintain the herd in a state of freedom, provided care is taken with added animals and the other circumstances are such that the risk of re-introduction of infection from other sources is nominal. Should, however, the water supply be under suspicion, for example, re-tests should be carried out at more frequent intervals.

Such methods are usually quite practicable for the owner of the slightly or moderately infected herd, but the owner of the badly infected herd is in a rather different position. It is, however, very rare to find any material percentage of reactors among the young stock and such being the case, there is already the foundation of a new stock to replace the older reacting stock. Where only a small percentage of the cows pass the test it is a waste of time and a source of disappointment to try to carry these on as part of the free herd. No hard and fast rules can be laid down for dealing with the badly infected herd, since so many factors have to be taken into consideration, among which are the need to keep up a regular milk supply, the facilities for isolation both as regards housing and grazing, the supply of cattle from free sources available for replacement and the financial benefits likely to accrue from the eradication of the disease.

In Scotland in recent years the demand for tuberculin tested milk has provided a definite inducement to owners of dairy herds to eradicate the disease. This demand has greatly expanded, owing to the use of this grade, where available, under the milk-in-schools scheme and more recently through the bonus paid to owners of attested herds on all milk sold from the herd. With the increase in the number of free herds came an increase in the number of cattle available for replacement, with the result that some owners found it more advantageous to sell out the whole of an infected herd at once and to purchase a sufficient number of replacements to keep up a reasonable milk supply, rather than to try eradication by the slower method of isolation with the gradual disposal of reactors.

Another factor which has hastened the elimination of reactors has been the assisted testing provisions of the Tuberculosis (Attested Herds) Scheme, under which the fees for testing are paid by the Department after less than 10 per cent. of reactors have been discovered at one test and these have been removed. This scheme has also had the effect of increasing the number of herds licensed for tuberculin tested milk production, as, when this stage of 90 per cent. freedom is reached and the reactors eliminated, application is made for a T.T. milk producer's licence, when, provided premises, etc., meet with the requirements of the local authority a licence can be granted and the owner thereby has a chance of getting some immediate benefit from his efforts.

Apart from slightly infected herds the most common method adopted nowadays is a compromise between isolation and the immediate disposal of reactors. In the latter case, reactors are isolated for a year or possibly two, depending on the number of heifers in the herd, and when the percentage is not more than 10, all the reactors are disposed of, and if necessary, some cows are purchased to make up the stock.

In conclusion, the point must be stressed that the maintenance of a tubercle-free herd by purchases instead of breeding cannot be recommended. The extra price for replacement

animals from reliable sources will usually be too high to make such a procedure economical, while the introduction of animals which have passed a test, from such doubtful sources as markets, even with isolation and a subsequent re-test, will lead to disheartening disappointments and will do nothing towards the general eradication of the disease, though it undoubtedly will eliminate almost completely the risk of tuberculous milk being sold from the herds in which such methods are practised.

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There was a good attendance in the Grand Hall, Town Hall, Bournemouth, when the foregoing paper was considered by the Public Health Section of Congress, N.V.M.A., on Tuesday, July 27th, 1937, the Section meeting under the Presidency of Mr. S. B. Vine, M.R.C.V.S., at 11 a.m.

The President of the Section having invited the author of the paper to contribute any remarks he might desire to make by way of introduction,

Mayor A. Douglas, M.R.C.V.S., D.V.S.M. (Vict.), (Ayr), said that he had stated in his paper that the control fluid which had been issued for use in conjunction with the synthetic medium tuberculin was of very little use. Since writing the paper he had been trying the control fluid and using an increased dose. He found that if one injected ·15 to ·22 c.c. instead of ·1 c.c. one produced a swelling which was indistinguishable from that in a typical non-reactor.

Discussion

Mr. S. V. Gollege, M.R.C.V.S. (Trowbridge), who opened the discussion, said:—

In view of the fact that the new Agriculture Bill caters for a big drive against bovine tuberculosis, I feel that Major Douglas's paper is most opportune and one which is of considerable interest to most of us. The essayist has surveyed the subject in a most admirable manner and it affords me great pleasure to compliment him upon the excellence of his contribution. Quite rightly I think, the paper has been divided into two parts, first the tuberculin test which must be the foundation stone of any eradication plan and second, the measures to be adopted in cleaning up a herd.

Since the double intradermal test is the one officially recognised under the Milk (Special Designations) Order and also the Attested Herds Scheme, I consider Major Douglas wise in confining his remarks to this test and I wholeheartedly agree with him as to its reliability, though I would qualify this by saying that in order to obtain the best results, keen observation and strict attention to details of technique are absolutely essential. Although this test has now been freely used for some ten years, I fear that we are not all in exact agreement amongst ourselves as to the precise way it should be carried out and also its interpretation. No doubt everyone has at some time or another heard reports of unsatisfactory testing and although one hesitates to accept such reports as being true, I must admit from personal experience that some have been well founded. I think, therefore, it is quite time we agreed upon and universally adopted an exact technique, since I believe in the past difficulties have arisen largely owing to the fact that we have not all adopted precisely the same procedure. With this view in mind, I propose to discuss a few items which I consider may influence the results.

Synthetic tuberculin is, I believe, now generally employed and as already indicated by Major Douglas, it has certain advantages over the old tuberculin, but he misses one important point and that is, by using this medium one does not run the risk of protein reactions in non-tuberculous animals as sometimes happens with the old tuberculin. This may not seem to be of much consequence, since both tuberculins will evoke a reaction in an infected animal, but it is rather disconcerting to learn that an animal which one has cast from a herd on account of a reaction to old tuberculin, has subsequently been tested with synthetic medium and passed. Where the two kinds of tuberculin have been simultaneously injected into the same cow, I have seen a typical reaction to the old tuberculin and an equally typical non-reaction to the synthetic. I have also experienced reactions to sterile broth alone, so it would appear that the use of old tuberculin should be discontinued.

With regard to dosage, I consider the orthodox dose of ·1 c.c. should be measured within reasonable limits. I cannot see eye to eye with those who either guess the dose or vary it according to the thickness of the skin to be injected. In my opinion both of these procedures are open to objection and liable to lead to indifferent results.

As to the site of injection, I believe the middle of the side of the neck to be the best, though I admit it may at times be inconvenient especially when the cows are secured by yokes. Injections are sometimes made high up on the neck (near the withers), in the depression in the front of the shoulder and on the shoulder itself, but I think all of these situations not above criticism either owing to the increased thickness of the skin, an excess of subcutaneous tissue or the tenseness of the skin which may make it difficult to pick up a fold for examination. One point I consider important is to run the fingers over the proposed site to ensure that the spot selected is normal and free from blemishes. Unless this is done it may be found later on in the test that there is some pre-existing abnormality which tends to confuse the interpretation.

Clipping I agree is necessary though I must admit I am not quite so extravagant as Major Douglas and my patch is only about one-and-a-quarter inches square; one short sweep with a pair of ladies' shingling clippers. Occasionally the site of injection may not be marked in any way and I imagine that this may perhaps be in response to a request of the owner so that reactors may be disposed of immediately and not show a tell-tale clip mark. I do not agree with this practice, however, since at the 48th hour it may be almost impossible to decide where the injection was made. It may be argued that, if such is the case, the animal is unlikely to be a reactor but in my experience it is not uncommon for the second dose of tuberculin to produce a reaction when the first dose failed to evoke any suspicion whatever. Furthermore, I think one's foremost duty is to carry out the test in the approved manner rather than satisfy the dictates of the farmer.

As to the type of syringe and calipers employed, I regard this purely as a matter of personal choice but it is necessary to see that the syringe is pressure-tight and the needle leak-proof. I prefer the screw-on type.

The length of the needle I deem to be of some importance and I note that Major Douglas uses a needle similar to my own. Much shorter needles, however, only 2 or 3 mm. long, are often used and their redeeming features appear to be that they are almost unbreakable, the injections can be made at phenomenal speed, and that the average skin cannot be penetrated even though the needle be inserted at right angles. In my opinion, however, all these matters are of little moment compared with the very essence of the test which is that the tuberculin shall be injected deeply into the skin. I must say I am truly sceptical regarding the use of these ultra-short needles and very much doubt whether in an animal which is not highly sensitised the tuberculin will be injected deep enough to obtain a reaction. Reference to the report of the Medical Research Council on Tuberculin Testing indicates the importance of deep injection and one has only to do a number of superficial and deep injections in a series of tuberculous animals to realise how true this is. I think also that the angle of insertion of the needle should be varied according to the thickness of the skin which is to be injected and not all injections made at the same depth. Immediately after inserting the tuberculin, the forefinger should be lightly placed on the spot to feel for the characteristic pea.

At the 48th hour, careful observations should be recorded and where no definite reaction is evident, a second dose of tuberculin injected into the centre of the swelling resulting from the first dose. A little care in this matter will be well repaid when the final interpretation is made 24 hours later. It is not always easy to make a definite decision when on the last day one finds that the two injections are located side by side.

There is just one further point concerning technique which I consider should be superfluous to mention and that is, that all operations should be done in as cleanly a manner as possible to prevent contamination of the tuberculin. I remember one instance where about 100 animals were being tested, when a quantity of tuberculin was poured into an egg cup which was conveyed around the sheds without any form of protection. At the close of operations, the remaining tuberculin was full of hair and all manner of débris and to make matters worse, these dregs were carefully returned to the bottle presumably for future use.

As regards the interpretation of results, I have little to add to Major Douglas's remarks and I think if one follows the lines indicated, few errors or difficulties are likely to arise. I would, however, like to stress the danger of passing a cow which shows a swelling which is not a typical non-reaction. As stated in the paper, a slight reaction is often indicative of gross infection and it is simply asking for trouble not to adopt a very strict attitude and pass only those swellings which are not open to any shadow of doubt. Truly doubtful cases are sometimes met with but, in my experience, they are comparatively rare. When they are encountered the animal should be isolated pending a re-test.

There is one matter mentioned by Major Douglas which very much interests me and that is delayed reaction. A short time ago, I happened more by accident than design, to examine two cows which had passed a tuberculin test completed 48 hours previously. I was present at the final interpretation of this test and was quite satisfied that there was then no sign of reaction. Forty-eight hours later, however, both animals showed well-diffused swellings measuring in area about one-and-a-half by two inches. In view of the fact that the herd test disclosed over 90 per cent. of reactors, it seems not improbable that these two animals may have been in the incubative stage and perhaps nearing the time when they would have reacted in the usual way. Unfortunately the farmer gave up all ideas of obtaining a clean herd and it was not possible to follow up these cases.

With reference to the measures to be adopted in freeing a herd from tuberculosis, I think most of us will agree that testing must be repeated at frequent intervals until at least one clean test has been obtained; and also, that it is almost impossible to keep a herd free if it is not self-contained. I am rather doubtful, however, whether at the present time when the initial eradication in a herd has been completed, it is altogether safe to allow so long a period as

twelve months to elapse between the tests. I realise that this procedure is usual under the Attested Herds Scheme but I am inclined to think that although it might be satisfactory in herds which are particularly well isolated from other cattle, it should be permitted only when warranted by special circumstances. Major Douglas's advice as to the grouping of non-reactors which have been tied up next to reacting animals is obviously sound and I must acknowledge that this point had never occurred to me, but it is certainly worth while putting into practice.

No mention is made in the paper as to alterations to buildings before commencing eradication and I imagine, therefore, that the cowsheds in Ayr are such that the position does not arise. I refer more particularly to cribs, wall surfaces in front of the cows, irregular wall ledges and indoor water supplies.

In my own district, cribs composed either totally or in part of woodwork in various stages of decay, are not uncommon and the wall in front of the cows is often rough and full of crevices. As it is almost impossible to disinfect such places, I consider it useless to commence testing until such areas have been provided with a smooth, washable surface. A little woodwork, if in good condition, may be permissible and for the disinfection of this, I usually advise a thorough scraping followed by the application of a blowlamp and then creosote. Wall ledges should as far as possible be made up and dust traps eliminated.

Indoor water supplies may be responsible for spreading infection unless separate drinking bowls are fitted and they are of the pressure-fed variety. The channel system, where there is an open trough all along the shed, is sometimes encountered and this I regard as particularly objectionable. In my experience where this system has been in existence, the initial herd test has never shown less than 80 per cent. of reactors. It is true that these troughs lend themselves to easy cleaning and disinfection but it is doubtful whether one can rely upon this being carried out sufficiently often. With gravity-fed bowls controlled by a single ball-tap at the end of the shed the position does not appear to be quite so bad but there may be some interchange of water between the bowls and the pipes are apt to become very foul. I should be glad if Major Douglas could advise a practical and efficient means of disinfecting these pipes.

When the initial herd test shows a large proportion of reactors, I think it will be agreed that the best plan is to scap the whole lot and make a fresh start with heifers, but each herd presents its own little problem and it is not always possible to put into practice what one would most desire.

In conclusion, I should like it to be understood that if I have mentioned any seemingly insignificant detail in connection with the tuberculin test I have had very good reason for doing so.

Mr. W. Tweed (Somerset) said he would like to say how much they were indebted to Major Douglas for giving them his experience in this matter. He had also enjoyed Mr. Golledge's opening remarks. As was known, they were going to approach the problem of eradication in the near future on a larger scale, but under present conditions he had found that a most successful method of getting farmers to eradicate the disease in a voluntary way was to have a scheme whereby a practitioner or a whole-time veterinary inspector who came across a farmer willing to try, could immediately proceed to test the herd free. Such a scheme was operating in Somerset, and it had been most interesting to ascertain the amount of infection existing in herds tested for the first time. An average of 24 per cent. of reactors in approximately 10,500 cattle tested during the first year had been found which gave an indication of the problem of eradication in that area. The retests of these herds had shown that the majority were soon eligible to apply for financial assistance or for membership of the Attested Roll under the Ministry of Agriculture's scheme, if reactors were removed. He thought an important point in clearing a herd was to make the first test during the summer, as the owner could then isolate the cows which reacted in the fields, and they could be milked there. It meant they could be satisfactorily isolated and disposed of to the best advantage when they were down-calvers.

In regard to cleansing and disinfection of premises, he thought unless this was thoroughly carried out as in the case of foot-and-mouth disease by the Ministry, or by the use of a blow lamp, and the mangers, etc., cleansed by scraping, it was useless to attempt it.

He was pleased to see that Major Douglas acknowledged there was such a thing as a doubtful reaction. At the same time it was often the case that there were different interpretations of what was a doubtful reaction.

Swellings with no oedema measuring 12 to 15 mm. which they could lift up with the fingers, had no attachment to the tissues under the skin and no tenderness, were often met with and could not be classed as reactors; nevertheless, some of these "doubtfuls" found at a first test of a herd might be highly dangerous, and one way of dealing with them was to tell an owner the exact position and satisfy oneself with a retest with or without isolation of the animal in the meantime. From personal experience many of these cases proved to be non-reactors on retest, yet he had seen cases develop advanced disease, others had later given definite reactions, and some gave a repetition of the doubtful reaction when retested.

It was good practice to eliminate all young animals showing doubtful reactions, and in adult cattle to follow up these cases carefully.

He would like to ask Major Douglas's opinion in regard to the injection of a third dose of tuberculin in the same site at the 72nd hour in the case of a doubtful reaction. He had seen definite reactions produced 24 hours later in some of these cases by this injection; in others, the swellings decreased in this interval.

He would also point out that as the number of reactors found in a herd decreased, so did the number of doubtful reactions.

In regard to measurements, Major Douglas had suggested the measurement of the area of the

swelling rather than of the fold. He (Mr. Tweed) submitted that non-reactors needed no measuring and from his experience he thought it a waste of time. They might have to do it to satisfy administrative rules, but he thought it unnecessary and useless. If a veterinary surgeon was reliable, and he must be reliable to carry out this work, then his opinion that an animal was a non-reactor was good enough without measurements. Doubtful and reactor swellings should perhaps be measured both at the 48th and 72nd hours to prevent any dispute with the owner and for record purposes. If measurements of non-reactors had to be taken it considerably curtailed the amount of testing which each individual operator could do.

He would like to raise the point here of the legality of any veterinary surgeon issuing a certificate of having tested an animal without giving any description and identification number of the animal tested.

There was also the old question—once a reactor always a reactor; he thought once an animal had been classed a reactor it should remain so, which brought him to the point that he thought the public would demand a reconsideration of branding these animals.

He would also like to ask Major Douglas about identification methods. Had he tried the escutcheon as a site for marking, and did he know of any satisfactory ink for use in tattooing black cattle?

Captain J. C. Coleman (Swindon) said he would like to thank Major Douglas for his very able *multum in parvo* paper and Mr. Golledge for the excellent manner in which he had opened the discussion. He was in agreement with a great deal of what Major Douglas said, but he would like to criticise certain points. In the first place he wanted to make allusion to Major Douglas's unusual measurements of the skin. The test itself was undoubtedly an exceedingly delicate one and any means at their disposal which would assist them in coming to a correct conclusion should be made use of. They should not try to avoid things which they knew were helpful to expedite the completion of the test, but they should pay greater regard to the efficiency. They must take time and be efficient and not hurry to get the test over. His reason for saying that was that after an injection in many cases they would find a considerable diffusion round the original site of an inoculation and a *post-mortem* had confirmed his opinion that some of his worst cases had been those showing very small reaction. Reaction entirely depended upon the character and dimensions of the swelling. In only doing one measurement at 48 hours he thought Major Douglas was rather complicating his own position. The swelling sometimes extended to a considerable degree and if one went a very short distance from the original site of the inoculation the skin would alter to one, two and perhaps three millimetres in thickness. Therefore the measurement at 48 hours was most unsatisfactory. Major Douglas referred to large, hard swellings. For a considerable period he (Captain Coleman) had great difficulty in deciding whether they were reactions or not. He had taken special care and kept records and he thought he had discovered the reason. If one got very familiar by judging the thickness of the skin with one's fingers and then took half of it, which was the one fold, and inserted the tuberculin as near as one possibly could seven-eighths of the depth of the one fold, he thought one would get such uniform results as would repay for the extra trouble taken. He had records of 3,000 cows and the result was most remarkable.

Major Douglas had said he had not had the opportunities of making any post-mortems. That, he thought, was a most important assistance to becoming efficient in carrying out the test. It might not perhaps be quite so important as in the old days, when they had the old tuberculin to deal with, as reactions now were so much smaller and more definite. At the same time, it was of great assistance, when making oneself efficient, to have a *post-mortem* confirming, or otherwise, the decision one had come to. Another thing he always advised—and he always did it himself—if ever they hesitated and they were going to put an animal down as doubtful, they should not think they had a tuberculosis-free herd. With very few exceptions he had never found one of those he was doubtful over not proving a reactor upon a re-test. To him the replacement of reactors was one of the most difficult problems of all. The only satisfactory way was by getting the replacements from a tuberculosis-free herd. As Major Douglas had pointed out, to replace from an untested herd was very unsatisfactory indeed and, unless strict segregation was observed, they would find they had introduced into a herd that had been free for many years an animal that had reacted. For himself he could not see how this could be avoided unless some very strenuous measures were used to dispose of reactors. Until they had something like Germany had—a place where such cattle could be destroyed and cooked under special supervision and only sold if fit to be sold—he could not see how the expense was going to be met. He would also advocate, when the time arrived, that all reactors should be indelibly stamped. He had known on more than one occasion a beast turned out as being a reactor and then selected four or five times for other practitioners for testing purposes. In the majority of instances it had been again turned down, but in one or two instances such a beast had escaped and had been passed into a tuberculosis-free herd. That was a terrible thing. They had to be careful in adopting any measure of indelible branding until they had the matter well on the move, otherwise the farmers were not going to stand it. He was afraid one of the greatest bugbears at the present moment was that a number of operators were so anxious to see how many they could do in an hour. He wanted to emphasise that point. He thought efficiency was far more important than expeditiousness. There were those who said that second injections were unnecessary. Probably for those who had had very great experience it would be unnecessary in 98 per cent. of cases, but, unfortunately, even where the most expert were concerned, errors might occur and a reactor would be left in the herd. The second injection undoubtedly did intensify and make the reaction very clear, if the animal was a reactor.

Mr. K. D. Downham (Newport, Shropshire) said he was very interested in the paper they had been discussing. He would like to mention two points before he referred to what he considered was a most important point in connection with the tuberculin test. Firstly, he agreed that sometimes when one obtained a doubtful reaction at the final reading the 96th hour might be helpful. Some time ago he had the opportunity of carrying out a number of tuberculin tests upon cattle at intervals of a week over a period of over

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two months and he had obtained positive reactions in this sequence of tests.

He also wished to ask Major Douglas if he could inform them whether there was a satisfactory method of tattooing black cattle. Another point of importance was the fact that tuberculin could be obtained by farmers for testing their own cattle and a certain amount was done by farmers themselves. This was obviously wrong and he thought that before long something should be done to prevent it.

He considered that the control of tuberculosis by means of the tuberculin test could be very much speeded up in this country if we adopted the single intradermal method of tuberculin testing in the caudal fold. He had published early this year an account of tuberculin tests he had made upon cattle in twelve herds using the single test in the caudal fold with very satisfactory results. A prominent member of the profession when discussing the test disagreed emphatically with regard to its efficacy. Since then the speaker had been able to confirm his opinion of the value of the test. The particulars of this test were as follows: A herd in which there was 65 per cent. of reactors in the dairy cows at the first test, was tested at three-monthly intervals until no reactors were found. At the last test the single caudal fold method was used and it was then arranged that the County Veterinary Officer should carry out the next test three months later using the double intradermal method. This was done and no reactors were found. This appears to be evidence that the single caudal fold method is satisfactory, it saves at least one-third of the time normally expended on the test, and we have the experience of the American veterinary profession who rely upon this method for the eradication of tuberculosis in America.

Mr. R. H. Smythe (Camborne) said that Major Douglas had presented a very interesting paper which he had entitled "The Control of Tuberculosis by Means of the Tuberculin Test," and it was this heading which received his first criticism. If the essayist regarded tuberculosis eradication in the narrow sense, that was to say, the cleaning up of a given herd, then possibly the caption was justifiable and tuberculin testing was the only method of control available to him. But if he regarded tuberculosis eradication in the wider sense, or in other words, as applying to the whole bovine population, then he would have to mark time until someone had discovered an uninhabited island where the reactors might be marooned or he would have to wait until such time as the wholesale testing and branding or destruction of reactors was enforced by law.

He submitted that as it was carried out at present in this country, tuberculin testing was absolutely the most efficient means at our disposal for spreading tuberculosis throughout the country and was responsible for a great deal of the disease now so widely existing. It was all very well removing the reactors from a given herd but it was not at all well when, as a consequence, those reactors were distributed to other herds throughout the land. He knew that, as a result of the testing carried out in his own practice, each year several hundred reactors were removed from herds where their presence did not greatly matter and were sold later into herds which, up to that time, had remained fairly healthy. Let them bear in mind, they were neither purchased nor sold *as* reactors and were not identified in any way.

Major Douglas had told them that some record of the measurements was desirable, but he asked them to agree with him—and they would at a later date, if not that day—that the actual figures representing the measurements were of no value and the whole system of measurement could very well be dispensed with. If one consulted the powers that be one was told that without some such guide it would be impossible to say if the veterinary surgeon was carrying out his tests in an efficient manner. But again, he submitted, they would be no wiser in this matter if given the figures. No official, whether he represented the county council, Ministry of Health, or of Agriculture, could base any conclusion upon such evidence. It was the character of the swelling that counted and not its size, and it was a description of the character of the swelling which should be embodied in the certificate. These certificates were, in the majority of cases, issued to the vendor or the purchaser, either of whom might be a farmer or a dealer, and if it was impossible for the gentleman at headquarters to interpret a test from the measurements given, how much more difficult must it be for the layman? In fact, it was worse, for whilst a preliminary skin measurement of 5 mm., followed by 7 mm. and 8 mm. at the 48th and 72nd hours might, by virtue of the character of the accompanying swelling, be considered a reaction, yet, a reading of 5 mm., 8 mm., 10 mm., might quite well constitute a fair pass. One could not get a dealer or a farmer to appreciate this. Naturally he said, "Well, what are the figures for?"

As time was short he should like merely to mention one test, the subpalpebral or lower eyelid test, which he was privileged to demonstrate to them at the Congress held at Torquay some years ago. It had never received any official recognition, but it was used, he knew, by many practitioners who spoke highly of it. He regarded it as by far the best subsidiary test and he should like to know if Major Douglas had used it and what his opinion of the test might be.

Mr. H. M. Salusbury (Sheffield) said his only excuse for getting up was that he was in the fortunate position of having over a hundred of his results interpreted for him. In Sheffield he and his staff had had the opportunity of applying the tuberculin test and a few minutes after their reading of the test they were able to see inside the cattle and then have some idea whether their reading was right or wrong. They used the double intradermal test, employing an ordinary hypodermic syringe and a fine long needle. They had noticed, as others had noticed, that the depth of the introduction of tuberculin into the skin was very important in getting a reasonable interpretation of the result. Another thing they had observed was that the size of the dose had some bearing on the extent of the reaction (in those cattle which were reactors) but it made no difference in the non-reacting beast. In some instances where there was some doubt as to the reaction at the 48th hour he had, experimentally, injected ·2 c.c. instead of ·1 c.c., with the result that it often made interpretation easier. He did not, however, recommend this procedure; he merely mentioned that he had done it experimentally. He had been fortunate in that he had never yet found lesions of tuberculosis in a non-reacting animal.

In regard to measurements, he was surprised to hear that morning that where increases in skin measurements of 5, 6, 7 and 8 mm. had been found, these had been called non-reactors. He had never yet found any case of swelling of 4 mm. or greater where there were no lesions

of tuberculosis on *post-mortem*. In other words, an increase in skin measurement of over 4 mm. was a reaction without any semblance of doubt.

In the interpretation of results they all knew the typical non-reactor. Regarding reactions, they got two types, local and general. As a matter of interest, he had tried to find out whether there was any relationship between general or bodily reaction to tuberculin and the local or skin reaction. His figures showed that occasionally there were rigors, high temperature and so on in non-reactors, whereas in some reactors there were slight temperatures, dropping at the 48th hour and in many of the reactors there was no increase in temperature at all. So that was no guide. He had been trying to correlate the type of reaction with the lesion one found on *post-mortem*. There was some indication that there might possibly be something in it. He had hoped to arrive at a result after examining 100 cases. His idea now was that he might be a little nearer after examining 1,000 cases. Nevertheless, a point he wished to make was that the size of the reaction and the type and character of the reaction did not mean that where results were small they were to expect little evidence of tuberculosis; in fact, the opposite appeared to be the case. In cases of chronic extensive infection they would often get very little increase in size, very little pain, and not very much tenderness and oedema round about. If anyone was tempted to say he would like to put such an animal on one side as doubtful he would not advise him to do so, for in the majority of cases those were the tuberculous cows with extensive and old-standing lesions which most decidedly must go out.

Mr. R. E. Glover (Cambridge), said that, in the main, he was in agreement with what Major Douglas had said in his paper. There were a few points, however, to which he wished to draw attention. Major Douglas stated that he did not consider it was always necessary to use the opposite side of the neck when conducting a retest after a short interval. In this connection he would like to describe, very briefly, the results of some experiments which they had recently undertaken in cattle which were moderately or highly sensitive to tuberculin. Attempts were made to determine whether, in such animals, areas of higher or lower sensitivity existed around the site of an original injection of tuberculin. This was ascertained by injecting a series of animals by the double intradermal method and then testing the responsiveness of the skin, at short intervals at measured distances from the original site. In general, the results showed that up to three weeks an area of about two inches around the primary injection was definitely more sensitive than other parts of the skin: in other words, an injection close to the original site gave a better reaction than one which was more remote. From the third to sixth week, however, the position was reversed, since the tissues in the neighbourhood of the first injection were slightly desensitised. Normal sensitivity was regained after about six to eight weeks. On account of this temporary desensitisation—which incidentally was never complete—it seemed desirable, when applying a retest after a short interval, to choose areas of the skin which were not in close proximity to an original injection.

Major Douglas had rightly referred to the complication which might arise through the occasional existence of the avian type of tubercle bacillus in cattle. A limited experience with infections of this nature had suggested that, in some instances, the significance of a negative tuberculin reaction after a positive reaction, which was mentioned in the paper, might be referable to an initial avian infection which the animal was able to overcome. They had recently reported on two young animals strongly positive to both avian and mammalian tuberculins which were retested on several occasions and subsequently subjected to a *post-mortem* examination. One of these beasts reacted to both avian and mammalian tuberculins for about nine months: at autopsy it showed a single lesion in a mesenteric gland from which an avian strain was recovered. The other became negative first to mammalian and subsequently to avian tuberculin: on *post-mortem* examination it was free from visible lesions. Doubtless it, too, had been sensitised by an avian strain, but had overcome the infection. The evidence which they had obtained suggested that avian tuberculosis in cattle was mainly self-limiting. Whilst such infections were undoubtedly of importance, because they might render cattle tuberculin positive, no evidence had yet been obtained that spread from one animal to another was likely to occur.

Major Douglas had raised the question of the control fluid to synthetic medium tuberculin. He thought it was advisable to explain that this product was issued at the request of numerous practitioners who were a little perplexed when they used synthetic medium tuberculin for the first time. It should be understood, however, that this product did not bear the same relation to synthetic medium tuberculin as concentrated glycerine veal broth to "O.T.," and he was, therefore, doubtful whether it was of the same service. As was well known, concentrated glycerine veal broth produced, in negative animals, a reaction which was practically indentical with that resulting from "O.T." but, in both instances, the swelling was induced mainly by the constituents of the media and not by the active principle. Synthetic medium tuberculin, on the other hand, was a comparatively pure solution of the active principle and it had not yet been possible to prepare a control fluid which would induce exactly the same results in negative animals. He was interested in Major Douglas's observations on the use of 0·2 c.c. of control fluid, but wondered whether the results obtained with the larger dose might have been partially of a traumatic nature.

Mr. J. N. Ritchie (Department of Agriculture, Scotland) remarked that a good deal had been said about the question of the usefulness of recording measurements in connection with the intradermal tuberculin test. One point had not been brought out. If a measurement was recorded on each visit, one was satisfied one had actually observed that animal. There was some possibility that, if no record of measurement were made, and where a large number of animals was being tested, probably in bunches, a particular animal might be missed entirely at a particular visit. He thought it very necessary to make those records from the point of view of interpreting the test and providing a record was also made of the character of the swelling at the same time. Something had been said about the type of reaction and its relationship to the findings on a *post-mortem* examination. They had been carrying out tests throughout the whole of Scotland during the last two and a half years and he was beginning to think there was a possibility that because of the different strains of organisms in different localities they might get different types of reactions in different localities. For instance, they had noticed in the North

of Scotland they very often got a slightly larger negative reaction than they did in some other parts of the country and he questioned, from that, if they would ever be able to correlate the intensity of the reaction and the type of infection present in the animal on a *post-mortem* examination.

Mr. Glover had mentioned the question of avian tuberculosis. They had come across several cases in Scotland which they suspected of being avian in origin. There were five cases which they had followed up through the test and *post-mortem* rooms and which the Animal Diseases Research Association had been able to prove were avian in type. Until the organism was typed at a *post-mortem* examination he did not think there was any safe method of ensuring that the reaction found was of the avian type. They had been retesting animals suspected of avian infection with tuberculin and avian tuberculin and where the reaction to the avian was larger than the synthetic reaction it was not a definite proof that the infection was avian in origin, but where the reaction to avian was larger in the second test and the other had decreased in the interval he thought they might fairly say that the infection was avian. Mr. Glover had said that animals infected with the avian type of organism would throw off the infection and were probably safe. He agreed, but submitted that they had no method until a *post-mortem* examination was made of being absolutely certain that an animal was infected with avian tuberculosis and not with bovine tuberculosis.

Mr. F. A. Davidson (Chief Veterinary Officer, Staffs. County Council) said a paper by Major Douglas was always worth listening to and discussing. Although he said he had not had much opportunity of following up results, etc., he had strong circumstantial evidence in having to go back and face the same cows year after year. He thought the work of Major Douglas on those lines was of exceptional value and probably of more value than much of the *post-mortem* and laboratory work done on that subject. He would not say much about the method adopted for injection but he would like to recommend English workers to use the headlamp which shone on to the spot they had to work on. He rather liked Major Douglas's idea of measuring the area in addition to or instead of the thickness of the skin. The question of avian tuberculosis was very important in the Midlands of England and he agreed with Mr. Ritchie as to typing the organisms. They were able to do that in Staffordshire in their own laboratory. They had not only traced it from poultry, but from poultry through pigs to the cattle. He had found these doubtful reactors in herds in which reinfection had occurred after a free period and they were fairly certain as to how the reinfection, not avian, had occurred. As regarded disinfection he recommended that whether chemicals or the blow-lamp were used they should be preceded by hot water and soda. No disinfection, he declared, was of any value without that. Major Douglas had said nothing about eradication in heavily infected herds. In the Midlands that was one of their main problems. There the percentage of reactors in young stock was often very high. The only way to solve the problem was the gradual replacement of cows by non-reacting heifers; but gaps in sheds should not be filled except by cows from the top end of the shed, which was disinfected and the heifers placed there; thus the adult reacting cows were pushed down the shed until replaced. That was all right until an abortion occurred and the sequence of young stock was broken. If any group of heifers, home-reared or purchased, showed above 10 to 20 per cent. reactors they might as well sell the lot, as the remainder would usually react sooner or later and, therefore, they should secure groups with a high percentage of non-reactors.

Colonel J. A. Dixon (Leeds) said there were two points he would like to mention. First, he wished to emphasise that when fresh animals were purchased for a tuberculin-tested herd the description of the animals should be far more precise and sufficient to identify them. In one place he knew of, dairy cows which were registered had a detailed description supported by an actual photograph. It would be a long time before they reached such a state of perfection as that generally. Unless they could arrange the satisfactory disposal of reactors they would not get very far. At present they were not controlling reactors and until they could get indelible branding of reactors they would do very little good. With such an increasing amount of tuberculin testing going on it was increasing the chances of the ordinary ungraded herd owner purchasing animals which had definitely reacted to the test. It was not fair to the butcher to sell them as fat cows or with any description whatever. Now that the stock owner was getting such a large amount of free veterinary advice and assistance—and he appeared to be in the way of getting still more—it would be only a fair proposition to make to him on his part that his reacting animals should be indelibly marked and then both butchers and other farmers would know what they were confronted with at the auction sales. At another Congress a few days ago an instance was given of an auctioneer in the South of England advertising an excellent opportunity for farmers to replenish their herds as all these cows (for sale) were in heavy milk and were doing well because they were reactors to tuberculin.

Councillor Bacon (Reigate) said he had heard that morning so many different opinions as to the way in which the tuberculin-tested herds were tested that he felt the time had come when there should be a standard test. Speaking as a layman, as one interested in several herds and as one who had seen the test carried out, he knew from farmers there were those prepared to buy reactors and dispose of the milk to the public. He was very interested in public health and various sanatoria and he felt it was a great shame that reactors should go to the public when they were not really fit for public food and when their milk was not fit to be drunk. If they were going to get an A1 nation the time had come for the Government to do something to assist the veterinary profession in the work they were doing. At present they were at a disadvantage. They were not defeating tuberculosis in cattle, they were just moving it about. The veterinary surgeon tested the cattle and the animals were moved off and sold somewhere. As regarded the reactors, he was convinced it was not for the veterinary surgeon to be dominated by the farmer. It was for the veterinary surgeon to do his job in a British way. He thought the reactors should all be branded and if anyone was buying a reactor he should know what he was buying. These animals should not be put into the market. He himself was very interested at the moment in getting a clean herd. They went down to the country not many weeks ago and bought cows which had a certificate by someone. Their veterinary

officer tested those cattle and they reacted. The difficulty was to know what to do with the reactors. Until something definite was done about them the work of the veterinary surgeon could not be effective. He was on a sanatorium committee and knew the numbers of young people suffering from tuberculosis and the number that were unable to get treatment and yet milk from reactors was being consumed by these people.

Mr. President (Mr. S. B. Vine), winding up the discussion, referred to the following passage in Major Douglas's paper: "It is admitted that at times no lesions may be found in reactors, but the absence of the converse—finding lesions in non-reactors—is much more important in the eradication of disease from a herd." He quite agreed with Major Douglas. They did get cases —which were very rare, but they did occur—in which they got no reaction to the tuberculin test and yet on a *post-mortem* they found lesions of tuberculosis. In two recent cases, in one of which there was tuberculous milk and in another tuberculous sputum, no reaction to the tuberculin test was obtained. The test was correctly carried out to test its reliability, on animals to be slaughtered.

The Reply

Replying to the discussion, Major Douglas said that in his opening contribution to the discussion Mr. Golledge was more lenient than he had reason to hope for. One of the points he made was possibly rather an important one in some parts of England—that was the question of the sanitary condition of the premises. He believed that the relatively high standard of premises in South-West Scotland had had a considerable bearing on the progress they had made and he could not suggest how it would be possible to disinfect such wooden buildings as Mr. Golledge had described. He heard one man suggest that the only suitable method was a fire. Regarding indoor water supplies, he had had trouble with the types of water troughs Mr. Golledge referred to, and he had had occasion in the last few months to disinfect one of those constant level type on account of an outbreak of anthrax in which one of the troughs had become definitely contaminated. Whether what he did was effective he did not know, but the connecting pipe which ran underneath the troughs had to be scraped with a long wire brush something like a flue brush. That was the best thing he could suggest because the pipe that ran below the trough had got full up with a nasty, thick scum and it was an ideal ground for the culture of bacteria of all sorts.

He was glad to hear both Mr. Golledge and a considerable number of other speakers agree that in the large majority of cases it was desirable to give a second test. In fact, as a routine matter a second test should be given, but Mr. Golledge and two other people referred to what were called delayed reactors. These were animals which apparently gave no reaction at the 72nd hour but which, if examined later, would be found to be definite reactors. When he said he had heard of some of those cases he meant to emphasise he had not met with any. But if the facts were as stated and there were a considerable number of these one would have to consider whether it was going to be necessary to make a fourth visit on or about the 96th hour. From his experience of a very large number of herds he did not think those animals could be very numerous, otherwise they would be getting some results from the leaving of those animals in their herds.

Mr. Tweed had advocated the use of the blow-lamp as a disinfecting agent. He (Major Douglas) thought there was nothing better. But why Mr. Tweed suggested there should be no measurement of non-reactors and that there should be measurement of reactors he could not understand. They all agreed that measurement was for the purpose of record and he should think the person who was going to read that record was just as interested in non-reactors as he was in the record of reactors. Mr. Tweed and others had again raised the question of the branding of reacting cattle. On the day when all cattle were tested and they knew exactly which were reactors and which were not, he was prepared to support the question of branding reactors, but until that day he would say that any man who bought an animal in the open market without knowing anything about it but what his eye could tell him deserved all he got. (Applause.) Nothing had been said about owners disposing of their animals unbranded. He thought it was most unfair to suggest because a man was trying to help himself and to help the milk supply that they were going to penalise him by making him brand his animals, whereas his neighbour who was doing nothing and whose herd might be in a very much worse state, was free to dispose of his animals as he pleased. (Applause.)

There was the question of identification, too. He believed the only satisfactory method was to have the animal tattooed, but some people had asked him a question which he had asked himself and many others, as to how they were going to get over the difficulty of tattooing an intensely black ear. Some black cattle would show up a black tattoo mark but there were others whose ears were so black that the marking would not show. In a number of cases, with care, they could read the little series of pin pricks which had been made by the tattooing instrument on black ears, but he would like to find a material which could be used which could be easily seen on very black ears.

In regard to what Mr. Coleman said about the necessity of making a measurement before making the first injection, he had found that in measuring a skin actually in millimetres the nervous condition at the time of the operation would effect that measurement to the extent of one or two millimetres. That was why he preferred to do the two measurements at the 48th hour, for then he could depend on getting a competent measurement. He thought Mr. Coleman exaggerated the possibility of such a wide difference in the two measurements such a wide distance apart. Mr. Coleman had also stressed the importance of *post-mortem* findings. Personally, he (Major Douglas) thought that a negative *post-mortem* carried out in the ordinary way meant very little unless they did not get obvious lesions, because they wanted to follow that up by laboratory methods. Of that Mr. Coleman made no mention and it was not open to the ordinary worker in the field. Really a *post-mortem* was of doubtful value in many cases and he thought the years of experience they had had in retesting year after year was just as good a guide as to what was and what was not a reactor as a series of *post-mortem* examinations which, after all, were very indefinite and inconclusive in their findings. He did not agree that all doubtful reactions were positive. That was a strong statement because what might be a doubtful reactor to one man

might not be so to another. He had had animals which he could not say had given a clearly negative result and which, on subsequent tests, gave no reaction and remained in herds which had remained free for years afterwards. Surely these were doubtful reactors that were not positive. He was interested in Mr. Downham's story of nine reactions in consecutive weeks because that was a thing he had not had the opportunity of doing. It would be very convenient if his single intradermal test in the caudal fold could be adopted. He had had no experience of it and had, therefore, no opinion to offer. Mr. Smythe also referred to the question of reactors but it was unnecessary to go into that again. They had all been emphasising the fact that it was not only the measurement but the character of the swelling that was the deciding factor. They had used the subpalpebral test and they liked it and found it very useful, though personally he preferred the one to which he had referred in his paper. He was surprised to hear Mr. Salusbury say that any swelling of over 4 millimetres was a reaction. It was interesting to know that those results had been confirmed by *post-mortem* examinations, but his experience did not allow him to go anything like so far as that. He believed Mr. Salusbury said he got high temperatures and rigors in animals giving no reactions. (Mr. Salusbury: "Up to 105 deg.") "If that was so then these other things which I have been looking on as definite indications of a reaction are of no value," said Major Douglas. "But Mr. Salusbury admitted giving a large dose and, therefore, getting a large reaction. I think, in making that admission, he is condemning himself. If he is going to get a large reaction, why does he give a large dose? It would be fairer to the test and lead to less complications if the recommended and generally accepted dose was given as the correct dose."

He thanked Mr. Glover for what he said about local hyper-sensitisation of the skin. Mr. Glover had said it only affected a comparatively small area. In his (Major Douglas's) retesting he had always gone a sufficient distance away from that special area so that in the retesting on the same side of the neck he had not been running the risk of getting wrong results. In regard to the control fluid, even if it was only producing a swelling he thought it might be quite useful to some operators to have the traumatic swelling which was indistinguishable from the former. It would be something for them to go on as to what might be expected in the testing of a herd. In regard to Councillor Bacon's experience of buying animals, with a tuberculin tested certificate, of which he knew nothing, Major Douglas said that until such buyers made certain that the animal they were buying was something more than an animal which would give no reaction to tuberculin at the time they bought it, then they were looking for trouble. In the West of Scotland they could supply Mr. Bacon with any number of cattle which would stand up to the tuberculin test. Major Douglas concluded with thanks to the delegates for their courtesy in listening to him.

According to the latest issue of Southern Rhodesia's Statistical Bulletin, the number of European-owned cattle in the Colony decreased in 1936 by 7 per cent. as compared with 1935, the comparative figures being 807,416 in 1935, and 753,419 in 1936. The decrease is attributed to increased slaughterings and a decline in the number of calves under one year.

The Use of a Chemical Branding Fluid as a Possible Method of Marking Black Cattle

During the discussion (recorded earlier in this issue) on the paper by Major Douglas at the recent veterinary congress, there were several inquiries concerning a suitable method of marking black cattle.

"The chemical liquid brand employed in North America may prove satisfactory," writes Dr. G. B. Brook, F.R.C.V.S. "The material which I saw in use took the form of a dark-coloured, viscous fluid, stated to be a mixture of coal-tar oils, barium sulphide and sodium hydroxide. It was manufactured by O. M. Franklin Blackleg Serum Company, Denver, U.S.A. (also Kansas City, Los Angeles, etc.). The fluid was poured into an oil can, the finer section of the nozzle of which had been removed. The material was expressed on to a branding iron, the "contact surface" of which had been rendered slightly concave. The instrument was then held firmly against the skin of the cheek or other area for about half a minute, hair growth at the site being thus permanently destroyed. If the hair is long and thick it is usual to clip the operation area. Quite rarely a local oedema persists for a few days after application of the brand. If the latter is applied at certain positions (hip, etc.) a scar is subsequently visible in the hide, the commercial value of which is decreased.

CHEMICAL LIQUID BRANDING

"The accompanying photograph, which depicts the brand mark seven days after operation, was given to me by members of the Tuberculosis Eradication Division of the Bureau of Animal Industry, Washingfon, D.C., U.S.A., under Dr. Mohler, from whom more precise details of the method could doubtless be obtained.

"The brand in the illustration is a large one as it was intended to identify a reactor consigned for slaughter. I see no reason why smaller marks could not be employed in this country for the recognition of non-reactors."

Anti-Gas Precautions*

Points of Interest to the Veterinarian

N. M. CLAYTON, M.R.C.V.S.,
Veterinary Officer, Birkenhead

Any scheme of anti-gas precautions adopted throughout the country must depend, to a great extent, on the voluntary and whole-hearted co-operation of at least 5 per cent. of the total population. They must be fully trained in times of peace to be ready in times of war. It might be easy to forget what happened in this country during the last war, due to the visits of hostile aircraft, but at the same time let us hope that we have learned from experience. One cannot help mentioning the fact that the horse is fast becoming out of date so far as modern artillery, etc., is concerned. From the humanitarian stand-point this is all to the good but, on the other hand, what are veterinarians going to do in the event of war? Those who are not fortunate enough to be allowed to join the R.A.V.C. will probably have to join up with some useful combatant corps but to their professional detriment. A good many, employed by local authorities, will probably be doing service in decontamination work and have the responsibility for the care of animals within the towns or boroughs, as well as D. of A.A. work.

I have attended a course of lectures on air-raid precautions and any information that I am giving is collected from notes, Home Office Handbooks, and answers to queries from various sources. I have endeavoured, as far as possible, to ascertain all gas measures appertaining to animals and although probably not as full as we would like, I hope the information will be helpful. Many veterinarians may find it inconvenient, or may not get a chance to attend a course of lectures, so I am speaking especially to them. Most towns during the last few months have been considering plans and ideas for their protection in times of hostilities. We people on Merseyside may feel that, as we live in a potentially vulnerable spot, the sooner we are well organised the better. Aeroplanes are built nowadays that will fly at a rate of 150 to 250 m.p.h. without the necessity of refuelling for four hours and can carry from two to three thousand lb. of bombs. The mechanism of a bombing plane is so accurate that provided the course map is correct in every detail, it is just as simple to bomb a particular spot at night, or in fog, as it would be in the middle of the day. In fact, as I shall point out more fully later, the dark and the fog are ideal factors for an air raid. In addition to possible attacks with gas bombs there is the danger of high explosive and incendiary bombs being used simultaneously. This forms the ideal form of attack. Before I can mention decontamination and treatment of casualties, which is what you want to hear about, I hope I may be pardoned if I digress and mention the gases used, their actions and so forth. It is no good anyone trying to decontaminate anybody or anything following a gas attack, if the elementary principles of danger, further contamination, etc., are not understood. A man cannot simply walk out of a contaminated area into his own or a friend's house without first of all taking certain necessary precautions.

*Paper presented to the Lancashire Division, N.V.M.A., at Liverpool, May 21st, 1937.

The Gases*

There are four groups of gases that may be used in warfare. (A gas is any poisonous substance which is likely to be used in warfare for its poisonous or irritant effects upon the human body regardless of whether it is a solid, liquid or a gas.) These gases are grouped according to their effects upon the human body.

Group I: Chlorine and Phosgene. Choking gases. These are true gases. They can be turned into liquid under pressure and the liquid form is used for storage in shells, bombs and cylinders. These are non-persistent and quickly vaporise.

Phosgene.—This gas will corrode metals and rot clothing. It is invisible, but when released from a high concentration a white cloud is seen. It is rapidly hydrolysed by water. It has a smell similar to that of "musty hay." It causes a cough and watering of the eyes. If breathed in in any quantity it is very deadly, due to the severe injuries to the lungs. It has apparently a delayed action and by that one means that some hours elapse after exposure before symptoms appear. The respirator affords complete protection.

Chlorine.—This gas is readily obtainable and is used largely in many industries. It is invisible except in high concentration when it gives off greenish-yellow vapours. If there is moisture in the atmosphere, chlorine will corrode metals and rot clothing. It has a smell similar to that of "bleaching powder" and is non-persistent. It is deadly but not to such an extent as phosgene. The gas is very irritant and there is no period of apparent immunity once the symptoms commence, as in phosgene. The respirator affords complete protection.

*Explanatory Notes

D.M. ..... Diphenylaminechloroarsine.
D.A. ..... Diphenylchloroarsine.
D.C. ..... Diphenylcyanoarsine.
C.A.P. ..... Chloracetophenone.
K.S.K. ..... Ethyliodoacetate.
B.B.C. ..... Bromobenzylcyanide.
Mustard. HS. ..... Dichlorodiethylsulphide. $CH_2.CH_2.Cl.$ $CH_2.CH_2.Cl.$ > S.
Lewisite ..... Chlorvinislarsine Dichloride.

Group II: The Nose Group. They contain arsenic, are solids and are dangerous.

D.M. Yellow crystalline solid.
D.A. White " "
D.C. " " "

These gases get into the air by heat and detonation which break them up into minute particles, when they form particulate clouds which are invisible and have no smell. Their effects are delayed a few minutes after exposure but they are effective in low concentrations. This is the group that would probably be used by one army against another at close range—create surprise and take the enemy off guard—and is being used in the Spanish War at present. The effects are unpleasant but pass off with no after-effects. One cannot breathe in sufficient of this type to cause arsenical poisoning but one may very quickly sustain it by swallowing contaminated food and water. Washing in contaminated water would bring about a nasty skin eruption.

Group III: Tear Gases. C.A.P., K.S.K. and B.B.C.

C.A.P.—A white crystalline solid which gets into the air by heat. It is invisible and has a smell similar to that of "Ronuk" floor polish. It is effective in low concentrations. In high concentrations one may feel a tingling of the skin, especially where one had shaved. It is non-persistent.

K.S.K. and *B.B.C.* are both brown liquids with high boiling points. They vaporise slowly and are therefore persistent. They will persist for several days. K.S.K. has a smell similar to "pear drops." B.B.C. has a pungent odour. The smells are not important because the effects are immediate, even in low concentrations. One might get lung trouble from a high concentration of B.B.C. The respirator affords complete protection.

Group IV: The Blistering Gases. This is the most important group. Mustard Gas and Lewisite are the two best known.

Mustard Gas.—This is often termed the King of Gases, and is a heavy oily or straw-coloured liquid in the pure form. In the crude form it is a dark brown liquid. The boiling point is 417° F. and as water boils at 212° F. it can be seen that it evaporates very slowly. It is extremely persistent. The freezing point is 55° F. In this country we are likely to get or encounter frozen mustard gas—thanks to our climate—for several months in the year. This mustard, while it does not give off vapour, is still very dangerous because contact with warm bodies will thaw it and any person walking over it would pick up some on his boots and on entering a warm room vapour would be given off which would effect any other person in the room. It is a very stable gas and not easily broken up into harmless compounds or by-products. It is soluble in most oils, including fuel and lubricating oils, animal and vegetable oils and fats. It soaks quickly into the skin and attacks the underlying fats. It has tremendous powers of penetration and will penetrate anything porous or semi-porous. Mustard gas will not penetrate china, porcelain, glass or metals. It is very difficult to detect and no two persons are agreed upon its smell. It is very poisonous—one spot the size of a pin's head will cause a blister the size of a half-crown or larger. The gas acts in secret and does not cause any annoyance or irritation on exposure except when the liquid gets into the eyes. The effect is delayed sometimes up to 24 hours. It damages in two ways—by the liquid and by the vapour. The respirator affords only partial protection—to the face and to the lungs. The rest of the body has to be specially protected and a further expansion of this point will be made later.

Lewisite.—Contains arsenic. It has never been used in warfare yet. Boiling point 374° F.—it is extremely persistent. In the pure state it is a colourless liquid, and in the crude state a brown liquid. The freezing point is 8° F.; it will therefore be giving off vapour long after water has frozen. It is soluble in all oils and fats and acts like mustard gas but is more corrosive. The delayed period is not so long as with mustard. The pure form has no smell but the vapour causes intense irritation to the nose, which is immediate and will necessitate the wearing of a respirator at once, or removal to another part of the atmosphere. Lewisite exposed to the air picks up moisture and then reeks of geraniums. The liquid on the skin causes intense irritation in about a minute. It is highly penetrative. One is liable to acquire arsenical poisoning through eating and drinking contaminated food and water. The respirator affords only part protection.

Methods of Attack: Gas bombs are more efficient than any land weapon used for the same purpose. Bombs containing non-persistent gases are likely to be large, while those with persistent gases are more likely to be small.

Appearance and Behaviour of Gas-bombs on Bursting

Non-persistents

1. Feeble report.
2. Little or no flame and little smoke.
3. Small white clouds which would soon disappear.
4. Small crater on soft ground and little or none on hard.
5. Probably a few large fragments of the bomb case could be found in or near the crater.

Persistents

1. Feeble report.
2. Little smoke. No flame.

3. Brownish mist of liquid droplets would be visible and would drift with the wind and disappear as they fell on the ground.

4. Small crater on soft ground, none on hard ground, but the crater would be saturated with liquid.

5. Large fragments of bomb case would be found in or near the crater, but these would be heavily contaminated.

Methods of Detecting Gas

Gas detection means the timely discovery that gas has been used and the identification of the type of gas used :—(*a*) by smell ; (*b*) by immediate irritant effects ; (*c*) by visible signs ; (*d*) by testing.

Testing.—Respirator test as used in drill.

By chemical agents. The British Government have in their possession an agent known as " Yellow Paint " which will turn red on contact with liquid mustard. By means of a piece of wood of convenient size treated with this paint and placed at a short distance from a man on look-out duty, the arrival of mustard gas in that vicinity would be detected. Another form of detecting this gas is by using long pieces of stick, about the length of a billiard cue, and shaped like a roller blotting-pad at one end. To this end are attached layer after layer of paper treated with yellow paint. The use of this method is to detect the exact area of contamination. As one piece of paper turns red on tapping the ground as one walks slowly along, it is removed and the piece underneath is used next. It takes 12 lb. bleaching powder to decontaminate 1 square yard of ground.

Factors Affecting Gas

1. *Wind.*—The stronger the wind, the weaker the concentration of any gas at any given distance from the point of release.

2. *Sun.*—Causes ascending air currents which carry the gas with them and tend to disperse it.

3. *Temperature.*—There are three kinds in this country :—

(*a*) *Temperature Lapse.* Occurs on a hot day when the temperature of the air is cooler the higher one goes.

(*b*) *Zero Temperature Gradient.* Occurs at dusk and dawn when the temperatures of the atmosphere are more or less constant. One has only to think back to " Stand to " in the trenches, waiting for something to happen.

(*c*) *Temperature Inversion.* Occurs at night and sometimes on a cold day, when the temperature of the air is warmer the higher one goes.

4. *Fog or Rain.*—Dull, foggy weather, or when it is cloudy, are conditions very favouralbe for putting over gas, as the fog or clouds act like a blanket, keeping the gas down and hindering its dispersal. Light rain has no effect. Heavy rain tends to wash the gas out of the air.

5. *Nature of the Ground or Presence of Obstructions.*—Gas will follow the " lie of the land " along with the main air currents, and will sink into hollows and depressions. Obstructions like woods, collections of trees, haystacks or buildings, tend to hold up the gas.

Factors Governing Persistent Gases

(*a*) Quantity of liquid on a given area.
(*b*) The temperature of materials contaminated.
(*c*) Action of wind and rain.
(*d*) The nature of material contaminated.

Favourable Factors for Persistent Gases

(*a*) Heavy contamination.
(*b*) Cold weather.
(*c*) Absence of, or shelter from, wind and rain.
(*d*) Absorbent materials.

Unfavourable Factors for Persistent Gases

(*a*) Light contamination.
(*b*) Warm or sunny weather.
(*c*) Exposure to wind and rain.
(*d*) Impermeable material.

Favourable Factors for Non-persistent Gases

(*a*) Dull, foggy weather ; (*b*) zero temperature gradient, or temperature inversion ; (*c*) wind not more than 12 miles per hour.

Unfavourable Factors for Non-persistent Gases

(*a*) Bright sunny weather ; (*b*) temperature lapse ; (*c*) heavy rain ; (*d*) wind more than 12 miles an hour.

All people utilised by our country, in gas attacks, on decontamination work—stretcher bearers, wardens, etc.—will be suitably protected with special clothing, covering from head to foot. I suppose one has seen pictures of a decontamination squad where members look like divers. The protective clothing consists of oilskin, with knee-length rubber boots. The hands are protected with oilskin gloves. The various units of a decontamination squad, or any other band of workers when in this kit, will be recognised by some distinguishing coloured ribbon or rosette. Some latitude in the full wearing of protective clothing may be adopted where contamination is not very heavy and the foreman allows the squad to work minus the jacket and hood. The whole suit soon causes perspiration and warmth, and to wear such a suit for many hours at a stretch is a hardship. It will be essential to keep to the windward side of the gas.

Effects of Gases and Treatment for Non-Vesicants

(*a*) Phosgene : *Effects.*—(i) Early. Smell of musty hay, cough, watering of eyes, tightness of the chest with probable pain. Nausea and vomiting.

(ii) Later. Oedema of lungs and perhaps death. The effects appear from 0 to 24 hours. There may be a period of apparent well-being, due to the so-called "delayed action" of phosgene.

Treatment.—Rest most important. Make the patient a stretcher case. Keep warm to ward off shock and shivering. Oxygen administered when breathing becomes difficult through oedema of the lungs.

(*b*) CHLORINE: *Effects.*—Similar to phosgene. Smell of bleaching powder. Very irritant without any period of well-being as in phosgene.

Treatment.—Similar to that of phosgene.

(*c*) NOSE GROUP: *Effects.*—Cause burning pain in the nose, mouth and throat. Pain in the gums. Sneezing and coughing and watering of the eyes; running from the nose and mouth. Headaches and pain in the chest. Nausea and perhaps vomiting.

Treatment.—Rest. Remove to pure air. Remove contaminated clothing. Remember that this group contains arsenic.

(*d*) TEAR GASES: C.A.P. causes pain in the eyes. Copious flow of tears. Spasm of the eyelids and irritation of the shaved skin. The effects are immediate and cease on removal to pure air. Treatment is not usually necessary but if the irritation persists, wash out the eyes with plain warm water or normal saline. K.S.K. and B.B.C. are practically similar.

Effects and Treatment of Vesicants

(*a*) MUSTARD GAS: *Liquid on the Eyes.*—Immediately irritant. Irritation may pass off temporarily but returns. The eyes are closed and a man is placed out of action in one hour. Free washing of the eyes with warm water, normal saline or sodium bicarbonate solution (10 grains to the pint). A douche-can with rubber tubing and nozzle is most useful in administering treatment. A drop or two of liquid medicinal paraffin or castor oil will prevent the lids sticking together if inflammation should occur.

Vapour on the Eyes.—There is no irritation during the immediate exposure save possibly tears, if the concentration is high. Later, irritation with swelling may occur with temporary blindness within 24 hours.

Liquid on the Skin.—No irritation on exposure. Redness commences in about two hours and progresses to swelling and blistering. The blisters appear in from 12 to 24 hours. The itching is difficult to treat. Use lotio. calaminae, potassium permanganate 1/10,000; or sodium bicarbonate in a saturated solution.

Vapour on the Skin.—No irritation on exposure. Some hours later redness, perhaps developing into swelling and even blistering. In 24 hours or longer, in the unprotected, the eyes are most likely to be damaged and the skin the least likely. The stomach and intestines will be severely injured by swallowing contaminated food or water. The effects are always delayed, but for varying times, dependent upon concentration, time of exposure, part affected and whether by liquid or by vapour.

Vapour on the Lungs.—No irritation on exposure but a garlic-like odour may be detected. Later, loss of voice and a cough develops which might progress eventually into bronchitis or broncho-pneumonia. The cough is dry, hard and brassy. Cases become serious if not treated quickly.

(To prevent horses carrying the contamination on their shoes, etc., long boots have been tried and recommended.)

Treatment.—The poison sinks rapidly into the skin owing to its power of penetration and to the fact that it is freely soluble in fat, and spreads like ink into blotting paper. It damages at once the superficial area with which it first comes in contact, but it takes time for this damage to spread far enough to produce the final results of erythema, blister or ulcer. The important points to consider are:—

(*a*) How long has the patient been exposed?

(*b*) How can the action of the poison be arrested? The only efficient antidote is chlorine. Chlorine, owing to its irritant and poisonous properties cannot be used, so bleaching powder has been substituted. It is efficacious, cheap and fairly safe, although an application of this dressing will have to be washed off the skin quickly, to prevent caustic action. Bleaching powder is made up into a paste or ointment. The paste consists of small quantities of water added to special tropical bleach and stirring continuously until one gets a cream-like consistency. The ointment is two parts bleach to one part white vaseline. Cover the contaminated area and immediately surrounding skin with a dressing; rub well in for a minute and remove by wiping off with a dry rag, in the case of the ointment, and plain water in the case of the paste. Prevent the bleach getting into the eyes. Wipe off liquid mustard from the skin before applying the dressing. Burn all contaminated rags. All contaminated clothing, of course, will have to be removed before treatment commences. (In the case of animals one can adopt the same principles.) The removal of contaminated clothing will be done in special First-Aid Posts or dressing stations and fresh clothing supplied. Ways and means have been devised whereby the contaminated clothes and persons do not come in contact with the clean counterparts. I would suggest the same policy in dealing with animals.

To revert to treatment, soap and water, and solvents such as petrol or paraffin, have their uses. After removal of clothing the body is washed in soap and water. If one notices any

mustard gas on any part of the body, wash off with a rag dipped in solvent. In washing off the mustard from the hands and wrists, take particular care that the mustard does not run along the arms. In dealing with cases before they arrive at a dressing station, keep the contaminated away from the clean.

(*b*) Lewisite. *Liquid on the Eyes.*—Immediately effective. Permanent injury.

Liquid on the Skin.—Stinging and redness. Quickly developing blisters.

Vapour.—Severe irritation. This compels immediate use of the respirator, and withdrawal from tainted atmosphere.

Treatment.—Similar to that for mustard, but a very important point is the treatment of the blisters. As Lewisite contains arsenic, the blisters should be evacuated aseptically to prevent its absorption into the skin. In mustard cases do not open the blisters. To distinguish Lewisite from mustard, let me once again refer to the characteristic reek of geraniums with Lewisite.

Doubt might arise as to whether certain casualties are suffering from the effects of tear gas or lung irritant gas. The presence of lachrymation might be due to exposure to tear gas or to a strong concentration of lung irritant gas; but if other symptoms, such as coughing and tightness of the chest, were absent, this would be strong evidence in favour of diagnosis of simple tear gas affection.

Other Probabilities. A question was asked of the danger from aerial bombs containing bacteria. Would the respirator afford safe protection? The reply was that it is quite possible for cholera bacteria, for instance, to be used in this manner. The Government had had this in mind. Further, the respirator (or rather the chemicals contained therein) would not be of much service as it was; but special discs would be issued for insertion into the respirator, in the event of hostilities taking place.

Hydrocyanic Acid and Sulphuretted Hydrogen:

Both paralysing agents. Have been tried before but without much success. However, improved methods of employment might bring them back to use. Both gases would have to be in strong concentrations to do much damage.

Decontamination

This is such a large subject that I will confine my remarks to a few items of interest to the veterinarian.

Foodstuffs.—If packed in air-tight tins, cover with bleach ointment, leaving for 15 minutes, then wipe off and burn the rag. It will be interesting to follow the uses to which cellophane paper will be put. It does appear to be able to resist mustard gas, if air-tight.

Exposed Foodstuffs.—Destroy, as they are useless.

Water.—If water is suspected to be contaminated, boiling from 30 to 60 minutes will suffice.

Large Reservoirs.—No danger except in the case of contamination of water with Lewisite (contains arsenic). Better call in an expert.

In decontaminating roads smeared with mustard, care must be taken to avoid the violent action with pure bleaching powder, due to the intense heat generated. Better to mix sand or earth with bleach. Again, on roads, a good deal of the mustard may be removed by washing down with water. A wooden floor may, owing to gross absorption, have to be taken up and burned. There will be occasions where a contaminated area—for example, parks and clearings—by careful marking off and roping round, may be sufficient precaution and allow evaporation. There are likely to be so many occasions when immediate decontamination is essential to life and property, that to avoid dissipating the resources of trained men, leave untouched places without detriment to public safety.

Collective Protection

The necessity for collective protection is to circumvent the wearing of respirators for long periods, the necessity for eating and drinking, the protection of the body from mustard vapour, and the difficulty of fitting respirators to children and sick persons. The position is that there are millions of respirators stored away, in readiness, but they are only of the adult pattern. There are none for children under 16 years.

This is due to the fact that as the contour of the head and face alters so often during development, no one type respirator could be made to fit all children. It is anticipated that following an air-raid warning, children will be collected into gas-proofed buildings before any danger could arise.

Respirators have been tried with success on horses. After the third or fourth time the animal begins to jib.

The principle to adopt in the erection of gas-proofed establishments is to prevent poisonous gases from entering a building through defective window-frames, cracks or holes in the walls or roof.

Provisioning and Storing in a Gas-proofed Room

It may be of interest to mention this, if solely for the principles involved. The following articles would be necessary in a gas-proofed room—in one's own house, for instance:—Food and water; plates, knives, forks, spoons, etc.; sanitary buckets and screens around;

disinfectant; hammers and nails; books, periodicals, cards, games, etc.; electric torches in case the town lights fail; blankets for warmth and gas-proofing. Remove all heavy furniture which occupies so much air space, and utilise light furniture instead. Do not permit anyone to enter the room without first of all removing outer garments and substituting a blanket. Do not move about; exertion uses up the little available oxygen in the room. Occupy the minds of the inmates with something to keep their thoughts off the raid. No smoking, nor naked flames allowed, therefore no fires, to prevent the using up of oxygen. Any food not in the gas-proofed room must be left in air-tight tins. Do not leave the room without first of all making sure it is safe to do so, *i.e.* by the respirator test for gas.

Do not select a top storey for gas-proofing because of danger of direct hit; nor an underground or cellar kitchen; the first floor is most suitable.

Gas Proofing of Stables, Kennels, Etc.

Although I have not been able to gather anything definite on this subject I feel that the same principles will have to be adopted as for shelter for human beings. In towns, regarding byres, stables, kennels, etc., arrangements will have to be made for the gas-proofing of some portion of the establishment concerned. Select places that are not low-lying, or in hollows or depressions, as gas tends to find the lowest level, being heavier than air. Any attendant staying within the gas-proof shelter will have to be made comfortable and be taught to be quiet and calm during a raid. Farms on the outskirts of an industrial town would probably have to be proofed, but right out in the country where farms and houses are more scattered, there is not the same need for any precautions; animals could be turned out to grass without much danger of a concentrated gas attack. If one were to suffer losses in the countryside through hostile air-craft dropping bombs after losing direction, one could count oneself very unfortunate. In passing, I should imagine that long-woolled sheep or goats contaminated with liquid mustard would have to be handled with care, if not with anxiety.

Organisation

Most county boroughs and large industrial towns and cities have been considering, of late, plans and ideas in connection with defence. Such plans need not follow any arbitrary model form, but should be adopted and adjusted to take advantage of all local facilities which could be incorporated in a useful manner.

The training of the necessary personnel and the equipment required would be the next consideration. Such organisation should include:—Mobile first-aid parties, dressing stations to which persons with comparatively minor injuries or suffering from gas or wearing contaminated clothes could walk or be carried for treatment, and if necessary, fresh change of clothing; casualty clearing stations for serious cases; base hospitals, situated as far as possible outside zones of special danger, for cases evacuated from the casualty clearing stations; ambulance service; laundry facilities for contaminated materials; clerical organisation for keeping records of casualties, their property and valuables, and their places of treatment; decontamination squads; fire extinguishing squads; street wardens, etc. Up to the present I do not think any pamphlets have been issued with regard to the evacuation and care of injured animals but I do think that such measures should be included in any scheme. Veterinarians will be able to offer advice to the local authorities concerned. Co-operation of local authorities will be appreciated and helpful, and there should be an interchange of personnel for assistance should there be occasion. The more the full scheme of organisation recommended for a County Borough is modified and simplified, however, to meet other sets of circumstances, the greater will be the need for the co-operation of neighbouring authorities for the purpose of obtaining, by joint action, the facilities which could not be specially provided in each part of the area.

Ambulance and Other Mechanical Transport.

Enormous numbers of motor vehicles will be needed throughout the country and as they are expensive, will eat up a large amount of money voted for Air-Raid Precautions. It will be expected that towns will have to assist each other in the case of transport.

Local authorities will be responsible for the giving of raid warnings; the controlling of the lighting system; the control of conflagations; decontamination of gas-contaminated public places, property and contents therein; vehicles and food supplies. The personnel for all these services will have to be trained. The scheme for each area should accordingly provide for a reasonable number of trained men together with arrangements for concentrating men and materials immediately at the place or places where gas attack has occurred, and for a full measure of mutual assistance with neighbouring areas.

As an example of organisation, let us take my own town, Birkenhead. There will be 15 to 18 decontamination squads. Included in each squad will be a sanitary or meat inspector whose job it will be to seize and see loaded on the decontamination wagons all tainted food, see to the decontamination of air-tight tins, etc., if smeared with liquid mustard; look out for

animals that have been injured or gassed. They will have necessary dressings available, and humane killers too. The whole of this work will fall under my jurisdiction, if I am left here. All these inspectors have undergone a course of air-raid (anti-gas) precautions and as time goes on will be further instructed in the care of animals. Although they have not yet been asked, other local veterinarians will be approached for assistance and I feel certain that, if these gentlemen's services are available, they will come forward. The same holds good regarding the R.S.P.C.A. officials.

Large factories, warehouses, agricultural colleges, etc., will be expected to make their own arrangements for precautionary measures and train the necessary personnel.

A Tentative Question: *The Milk Supply.*—Cardboard discs on milk bottles will be useless against mustard gas. I suppose air-tight tin discs will have to be utilised. There is an added danger of high explosives shattering milk bottles in a depôt. Will the gas-proofing of milk depôts have to be advocated? I do think that the whole question of the supply of fresh milk will have to be seriously considered.

I think I have covered most of the ground, but if I can answer any questions I shall be only too pleased to do so. The Government is not asleep (as is commonly supposed); many experiments have been undertaken and are going on daily in connection with gas warfare—attack and defence. Our country has learned a good deal from the Spanish Civil War so far as modern warfare is concerned—and is obtaining valuable information as time goes on.

References

Personal Protection Against Gas. No. 1.
First-Aid for Gas Casualties. No. 2.
Decontamination of Materials. No. 4.
Air-raid Precautions in Factories and in Business Premises. No. 6.
Organisation of Air-raid Casualties Services. Memo. 1.
Rescue Parties and Clearance of Débris. Memo. 2.
Organisation of Decontamination Services. Memo. 3.
N.B.—Medical Treatment of Gas Casualties is now in preparation.

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DISCUSSION

Major A. B. Mattinson, congratulating Mr. Clayton on his most excellent paper, said he appreciated the honour of being asked to open the discussion, but he felt that the choice of opener had fallen on the wrong party, as he was no authority on the subject. He feared that he was likely to under-rate its importance, and hoped that other members would join issue with his views.

He thought that discussion as regards decontamination and the protection of food-stuffs, would be better dealt with by some member in the service of a municipality; the methods laid down seemed very comprehensive, and he thought that some simpler methods of protection for foods would be devised. It seemed certain that the use of poisonous gases must be limited by chemical and physical considerations, nor did it seem probable that the number or variety of such fluids could be much extended. If this were so, it would probably be only a short time before defensive protection was improved and simplified.

He considered that the risk of spreading disease by means of bacteria was very small, and possibly confined to such places as water-works, and collecting grounds, where unprotected. He thought that the intense heat generated by a bomb falling from any height would effectively sterilise any bacterial contents.

In the County of Lancaster, gas defence arrangements were in the hands of the Constabulary, and it was intended to develop these by liaison with adjacent municipalities and the formation of a body of gas-wardens, working in conjunction with fire brigades, ambulance corps, nurses, and the sanitary staffs of local authorities. Major Mattinson did not understand Mr. Clayton's reference to the necessity of co-operation of "at least 5 per cent. of the total population." His opinion was that in the event of war, *all* persons physically fit would co-operate, voluntarily or otherwise. It seemed to the speaker that this was an integral part of home defence service, and depended no more on voluntary recruitment than would the fighting services, though there might be, in part, control by the Home Office and local authorities.

He did not agree that the horse was fast becoming out of date, as stated by Mr. Clayton, though in the British Army mechanisation had been pushed to extreme limits. The armies of our potential Continental enemies had many more horses than in 1914, and the extent to which horses would be required would be decided by the venue and terrain of the next war. If, however, he should be correct, they would merely as a profession stand in the same shoes as all other professional men—except the medical profession, and he (Major Mattinson) felt sure that in accordance with British tradition, they would be able to give a good account of themselves in whatever sphere of activities their duties lay. He was of the opinion that in the event of serious war, most, if not all, of the duties of veterinary officers of local authorities would devolve upon the old gentlemen and young ladies of the profession, and that other members not in those categories, if not needed as veterinary officers with the troops, would simply "follow the drums," though he personally trusted that his lot might not be with infantry.

Mr. Clayton had said "The mechanism of a bombing plane is so accurate that provided the course map is correct in every detail, it is just as simple to bomb a particular spot at night, or in a fog, as it would be in the middle of the day. In fact, as I shall point out later more fully, the dark and fog are ideal factors for an air raid." Speaking simply as an amateur, he (Major Mattinson) disagreed *in toto* with that statement. The numerous accidents and faulty landings of which they read daily showed that the navigation of an invisible course was one of profound difficulty, even in a friendly country, with accurate maps, and a well-known terrain. For trans-oceanic or trans-Continental flights, deviations, unless very considerable, were not of great moment, except in so far as they threatened

the using-up of fuel, but where a definite objective must be attained within a time limit in a hostile country, with an active air-defence, night bombing was and probably always would be, of very limited *military* utility, though the combination of gas, incendiary and explosive bombing of big towns, ports, etc., was quite possible. The speaker pointed out the profound effects of fog on shipping though the ship had the advantage of a set course and dead-reckoning, and was not affected by altitude, which, to aircraft, was perhaps a more important factor than lateral deviation. Mr. Clayton had a very important "if" when he said "provided the course map is set correct in every detail." Maps of deadly accuracy were rare, especially of enemy country, and many of those present would be personally aware of the impotence of artillery fire by the map—and probably very thankful that this had been so. It was comparatively easy to lay guns to fire on say the "I" in Liverpool, by the map, but strangely enough, after days of bombardment, one found that either the "I" was not there after all, or was still sitting up and doing very well.

He would like to make a few observations, which, though not directly within the scope of Mr. Clayton's paper, were collateral, and very relevant to the subject of air-warfare. Lamartine once said "History teaches us everything, including the future," and one might take a general historical view of the use of weapons and the probable extent of the employment and usefulness of aircraft in war.

As a consequence of the use of modern weapons of precision, long range and flat trajectory, wars tended to become static, and like the last war, partook of the nature of a siege. The shorter the range, the more deadly the weapon; the arrow, pike, lance, sword, cutlass and mace, and that short-range fire-arm, the revolver in the American Civil War, had accounted for many more millions slain than any modern weapons. In six years, Napoleon I occupied every capital in Europe, but, in the late war, no capital of any importance was ever taken.

Other circumstances being equal, the advantages in war inevitably passed to the defensive; hence the demand for new weapons of attack, and the imperative need of surprise. The Germans had actually lost the late War when defeated on the Marne in September, 1914, as their objective could not be gained, and their offensive power broken. It was very questionable how far air attacks could be made by surprise after war had actually commenced, and for military reasons future wars were unlikely to be preceded by declaration of war, though espionage might be expected to supply the necessary warning.

He suggested that there would be war to-morrow, or even to-day, if aircraft and submarines were nearly so effective as was popularly believed. One might suggest that the aeroplane and submarine represented the weapons of the franctireur, or knife of the assassin, rather than the regular weapons of war, and were intended primarily to terrify the civilian elements of the population, and through them, to coerce a government to make peace at any price. This was the doctrine of Clausewitz, which was now the Bible of the Germanic tribes. It was primarily based upon the Napoleonic practice of unlimited war, with unlimited resources, and the levy *en masse* to which Clausewitz added the doctrine of "schrecklichkeit," or, as we knew it, frightfulness, by waging the most savage form of brutal war against the civil population. He said "the non-combatants must be forced by the severest measures to compel their leaders and armies to make peace," and many of them saw this practice, in all its stark brutality, in the late War. He thought that the increasing apparent importance of aircraft was definitely related to the Clausewitzian doctrine, augmented by geographical limitations.

He still regarded the sea as their first line of offence and defence, and was an unconvinced infidel as regards the popular view that battleships were now highly vulnerable to aircraft; as a layman, he could not think of a man-of-war carrying over 10,000 tons of armour being comfortably sunk by an aeroplane dropping a few bucketfuls of bombs.

He could not deal with anti-aircraft defence, but knew that it was now very highly developed, as compared with the "pom-pom" and similar primitive arrangements of 1914. Doctor Bullock had kindly given him some information from a book now out of print, "The German Air Raid on Great Britain, 1914-1918," of which the following was an extract:—

> "During the War, nearly 9,000 German bombs of a total weight of 280 tons were dropped on British soil in the course of 51 airship and 52 airplane attacks. London was bombarded twelve times by airship and 19 times by airplane. In all, 1,413 persons were killed, and 3,408 others were wounded as the result of these raids, London suffering more than half these casualties—670 killed and 1,962 injured."

One must admit that this must have been unpleasant in the areas attacked, but it showed the air forces to have extremely limited military value, when compared with the terrific slaughter in a few hours of battle in "the good old days" as at Borodino, Eylau, etc.

One evening, in August, 1914, that great Nobleman, Sir Edward Grey, said, "The lamps are going out all over Europe; we shall not see them lit again in our life-time." That threatened state of darkness and return to barbarism had only been averted by the greatness of Britain, and they must feel a thrill of pride in the knowledge of that fact.

If and when war broke out again, one hoped and prayed that their great country would be ready, and he did not think that any of their professional colleagues would be found wanting in any capacity in which the State might require the fullest of their services.

Mr. E. J. Burndred stated that it gave him great pleasure to say how much he had enjoyed Mr. Clayton's paper. He would especially like to congratulate him (Mr. Clayton) on having prepared for them a typewritten copy, so that they could have the privilege of scanning it at the beginning of the meeting. He was afraid that he was at complete variance with Major Mattinson. He had the privilege last year of spending a little time in the "cock-pit of Europe." In one of the large centres, a great exhibition was in progress, and a very large part of that exhibition was devoted to what appeared to him at first as something very foolish and demoralising. There was a large building which was devoted entirely to aerial warfare. As he walked round and saw most wonderful pictures of lesions of mustard gas, etc., he thought what a childish way it was to use modern knowledge of psychology. He saw gas-proof buildings, models of horses with gas-masks, and then he began to realise that their psychology was perhaps not at fault. As he sat listening to the

address that afternoon, he thought there would be three reasons for that kind of propaganda going on. The first would probably be educational. The second, particularly in industrial areas, an endeavour to promote fear of attack and so engender the desire for protective measures. And the third and most important reason would be to cause the unfortunate tax-payers to pay, without too much grumbling, for the rearmament programme. What they had to deal with very particularly was the question of the food supply. There would very shortly have to be efforts made to devise a container for the storing of milk which would be immune to the ravages of gases. He was concerned to know what was going to happen to the animal population generally of a country. They would at all times require food animals for meat and milk. He would like Mr. Clayton to discuss what possible precautions could be adopted with regard to these particular animals. Could they get some system of gas-proof shelters for milking cows, for example? If the Livestock Bill finally passed, would those large central abattoirs being proposed be built with an eye on the future? Were they going to have huge cold stores specially gas-proof? He felt that he would like to start these new lines of thought for discussion.

Mr. H. T. Matthews said that he had nothing to add to the discussion which would be a serious contribution, but he would like to mention one or two points. He found himself in opposition to Major Mattinson's estimate of the powers of aircraft in future warfare. He (Mr. Matthews) was engaged during the last War in the Air Force, so that he could speak more or less as a professional. Since that time, there had been many improvements in aircraft design, in the instruments fitted and weapons of attack. He found himself between Mr. Clayton's optimistic (or pessimistic) view that an aeroplane could drop bombs on any particular spot and Major Mattinson's expressed scorn of all the navigating capabilities under atmospheric difficulties of aircraft. The fact remained that the inhabitants of big cities were liable to be raided by enemy aircraft. It was easy to find a big city like London, Liverpool or Manchester. But having found that city, attack on a particular objective there was by sight and not by calculation. In that sense, Major Mattinson was correct in saying that bombs would be dropped on an area and not on a particular spot. There was apparently a tremendous amount of ignorance as to the effect of the gases to which they would be subjected. This was gradually being dispelled by the activities of the Government and chemists, etc. So far as he could see, the most dangerous gases with which they would have to deal were the vesicant group. The danger lay not in the immediate effects on animals so much as in the after-effects of the contamination of animals, foodstuffs and materials. He would like Mr. Clayton to give some indication of what would happen if a gas bomb dropped on a large stable or a farm carrying foodstuffs and livestock, or on a big abattoir. Would flooring material such as concrete or wood or setts become useless or could it be made reasonably safe again? If it could be made safe, what was the period it should be left vacant? Were there any means of knowing whether stocks of hay would be fit for use, or would it be safer to destroy it all? Could meat after contamination be utilised for human consumption without danger? If it was necessary to slaughter contaminated animals on humane grounds, were there any means of knowing whether a particular piece of their meat was or was not safe? They, as veterinary surgeons, would certainly not be able to be at all places where animals were alive after attack, and subsequently came under treatment. They would not have large stocks of bleaching powder available at a moment's notice. Would Mr. Clayton summarise what to do where animals were allowed to live after a gas attack and had become contaminated. What were the chances of recovery? So far as he (Mr. Matthews) could ascertain at the moment, the treatment they had was not likely to be very effective. Could Mr. Clayton give them the complete first-aid treatment for an animal affected by a gas attack? He was very glad that they had had the subject for discussion that afternoon, and he thought that Mr. Clayton was very brave to give an address on a matter about which they knew so little. He should like to express great appreciation of the manner in which he (Mr. Clayton) had handled the subject. (Hear, hear.)

Mr. G. Mayall said that so far as he could see, very little progress had been made, and he had not heard much about gas-proof shelters, etc. With regard to Major Mattinson's remarks about an aeroplane not being able to drop bombs on a particular spot, he would like to point out that his own town of Bolton had been bombed during the War, and the place which the enemy wanted to destroy was Bessemer's Forge. No bombs were dropped within a quarter of a mile of the Forge. Nothing had been said about gas-masks for horses, and he would like to know if anything was being done in this direction. He would like to read to the meeting an extract from a letter in the *Manchester Guardian* by W. McGregor Ross, headed, "The Gas Weapon in Modern War," in which he thought the members might be interested. The writer advised those concerned to read Vol. II ("Medical Services") of the official history of the War. From this we learned that the gases of 1916 could cause "a sensory irritation so great as to make a man drop unconscious, though immediate death apparently does not result." That trained troops were wiped out by effects of such "overwhelming rapidity that the casualty had no chance of attempting to leave his ground for aid." Major Lefebure added that fiercely irritant blendings were available "which compel the removal of masks." In any case, being sick into our masks would put them out of action.

Professor J. F. Craig stated that he had not a very useful contribution to make to the proceedings, and that his knowledge was not first-hand. He was not conversant with military tactics, nor with the accuracy of enemy aircraft which might come over this country, but realised the great development in the air services that had taken place and the possibilities of the damage that might be done whether the object aimed at was reached or not. It was very likely, no doubt, that if gas was used to a great extent means would be found of meeting it. It was the history of war from the beginning that where one weapon was used for attack, another came into operation for defence. What knowledge we had on the subject of gas warfare was largely directed to the effects on man, not to the effects on animals. As veterinary surgeons, they were more concerned with animals than man, and also, as previously pointed out, with the conservation of foodstuffs for human consumption.

He had looked up the official history of the War (Veterinary Services) concerning the effects of gas on animals during the last War, and felt that the meeting might be interested to hear some

extracts. The extracts referred to precautions to be taken against chlorine, mustard gas and phosgene, and to their effects. The statistics given pointed to a very small casualty list among horses from gas as compared with gun-shot wounds. Prolonged and careful trial on a large scale was given to the attempted protection of animals by means of respirators. The arrangements were found to be impracticable for the following reasons:—

(1) Chlorine gas which the respirators were used to defeat was replaced almost entirely by mustard gas, against which they were useless.

(2) The protection of the horse must be a secondary consideration to that of man; the latter first adjusts his own respirator and by the time this was done, it was too late to protect the horse.

(3) The casualties among horses exposed to the chlorine gas attacks were in fact so few that the heavy work and expense of maintaining respirators for use in special emergency could not be justified by results.

Even at the present time, it was accepted that the chief danger likely to arise for animals came from the use of gas of the blister group such as mustard gas. The provision of respirators even if effective would be an impossible task for animals of different types and sizes.

In the History of the War referred to, he went on, attention was drawn to the danger to man from the impregnation of a horse's coat with mustard gas and to the length of time that the gas remained in places after shelling or bombing. It was also pointed out that the areas of skin in the horses, chiefly affected, were those over the limbs, sheaths and mammary glands and that blisters varying from a few square inches to two square feet developed.

It appeared to him that in the protection of animals and food products the main consideration was the provision of suitable shelters, the treatment of casualties and the decontamination or neutralisation of the gases in contaminated areas. Perhaps it was possible to render many well-constructed houses normally used for animals and for storage reasonably gas-proof without undue expense. That was one of the problems that would naturally call for attention.

Several articles had appeared, notably in the *Journal of the Royal Army Veterinary Corps*, which sketched the important features of gas warfare. They might be used as a basis for further investigation. It seemed to him to be very desirable that a veterinary committee should be formed to enquire into the whole question of gas warfare and the preventive and other measures to be recommended to safeguard animals and food products.

He was extremely indebted to Mr. Clayton for his fine review of anti-gas precautions, and he thought it right that they as veterinary surgeons should consider the problem from their point of view.

The Reply

Mr. Clayton, replying, said that he was very much indebted for all the interesting points raised, and hoped that in his further remarks he would be forgiven for any apparent disjointedness, as there was a fair amount of overlapping and sometimes one question meant wandering around the point. He would like, first of all, to mention that in the proposed scheme for Birkenhead, certain stables and buildings would have to be inspected by him with a view to having them put on the list as suitable places for gas-proofing for animals and for receiving animal casualties. Consultations with the Mersey Docks and Harbour Board, regarding any gas proofing necessary at the Woodside Cattle Lairage, were going on. The Board was having squads of men trained in anti-gas warfare, too. This was a point raised by Mr. Burndred. Although schemes for gas-proofing stables had not been prepared, the principles would be similar to those for people. Modern stables with good ventilation by open roofs, louvre boards, etc., might not be the best for proofing, however, because of the extra work in plugging.

He wished to thank Major Mattinson for very kindly opening the discussion and he was sure that the Major's remarks had been worth listening to. He hoped that the Major was right, and he certainly had some interesting facts to impart, but nevertheless, he (Mr. Clayton) felt that they should be prepared, so that in the event of air raids, there would be no panic and probably few casualties so far as gas was concerned. He had been of the same opinion as Major Mattinson regarding the "hit and miss" attacks of fighting 'planes before taking this course of lectures but he had been more or less convinced that modern aeroplanes could go anywhere, provided our aeroplanes did not prevent them. Even allowing for an aeroplane being blown slightly off its course, considerable damage could still be done to suburbs of towns and neighbouring farms, particularly if aerial sprays and incendiaries were used. Regarding Major Mattinson's comments on bacteria in bombs, he was pleased to learn that the heat generated would nullify any danger.

Continuing, Mr. Clayton said that able-bodied men of 30 years and over (and women too) would be trained in anti-gas measures. The object of imparting knowledge was so that organisation, in every town, could be accomplished speedily. It was not the idea to terrorise people. Warnings of attack might only be a matter of minutes on the East Coast, and an hour or less in Liverpool, and safety depended upon a real and proper organisation. As to gas masks for animals, he did not think they were really practical on the whole, although he was not trying to condemn them. They might be useful for military horses, particularly if they were stationed in a dangerous area, and evacuation essential against an enemy, but in any case they would not be of much service against mustard gas. Racing stables and breeding studs might find them invaluable, but the human factor must play a great part in proving them satisfactory. One could imagine that the excitement of men and the fear and terror of animals during an attack would not be helpful in fitting respirators, particularly in the dark. Most European countries had produced their own equine gas masks, and some were quite good. Gas masks for dogs, apart from the variously-shaped heads, were not suitable owing to the fact that the dog perspired through his mouth and the contained air within the mask would soon become saturated.

With regard to Mr. Matthews' point about gas bombs dropping on a stable, if the flooring was wooden, it might have to be taken up and burnt; if cobbles and earth, the whole lot might have to be dug up and buried, that was, if mustard gas were used. The entire place might have to be isolated for some time, but if the stables were needed urgently, a decontamination squad would be employed. A system of dabbing, not rubbing, the walls, etc., with rags or waste, and burning, might be tried. The exterior walls of the stable would be cleared by bleach paste up

to about six feet from the ground, or they could be hosed down, if there was good drainage, and left to the weather. Interior walls could be cleared by using thick bleach cream and covering with brown paper until two layers of each were used, or they could be hosed down, but only if the floors were impervious. If the floors were of concrete, hose down and leave for 24 hours. For slates, use solvent, but a roof might be left to the weather. In preparing schemes for gas proofing of stables, buildings with wooden or absorbent floors should be avoided, if possible.

In reply to the question put by Mr. Matthews regarding the first-aid treatment to be adopted in the case of animals, he suggested, if a horse were affected by mustard gas, firstly the removal of all clothing or harness. The material removed should be put in a special place. This operation should not take place in the street, but in a special depôt if possible. As to decontaminating the material, there were different methods for different articles such as rubbers, leather, blankets. If any smears were observed on the animal, this could be washed off with paraffin. Then he suggested a good soap and warm water wash or shower. The mucous surfaces should be dressed with sodium bicarbonate solution. If there were any blisters, they should not be opened, and should there be any affected parts, rub on some bleach cream for a minute or two, then wipe off and burn the rags or spray with warm water. Bleach paste was not curative, and if damage was done to the underlying tissues, other agents would have to be resorted to. Particular notice should be taken of the eyes and treatment applied if affected. The skin of the horse was very sensitive and affected parts might be revealed sooner than in man. The animals would have to be looked after for some weeks, as recovery from mustard gas was protracted, particularly if there was sloughing or ulceration. He would emphasise the importance of isolation of the animal until it had been decontaminated. Similar treatment was suggested in the case of dogs. If the coat was badly contaminated, it might have to be clipped. Regarding sheep, there was always the danger that clipping long-woolled animals, particularly in the sunshine, might cause the mustard gas to vaporise, which might be injurious to the squad. Any squad clothed in oilskins, etc., could not keep up the pace for more than three hours even with rests in between. Therefore, it might be advisable to slaughter off a large flock of sheep thus affected, rather than resort to such measures.

In reply to Mr. Burndred's points about contaminated foods, meat, grain and forage, Mr. Clayton agreed that they were all important ones. If meat were contamined by gas, absorption would take place and apart from the effect on people handling it, there would be the danger of alimentary damage through its consumption, and it would be best to condemn such meat. Regarding grain and forage, in his opinion, it might be a matter of degree whether it should be partially or totally rejected. If the forage or grain could be turned out and turned over frequently in the presence of the sun, it might be saved. Grain might become contaminated accidentally through people walking over it. Crops might be ruined or rendered dangerous for feeding animals for some considerable time. Contaminated forage might injure the lips, tongue and muzzle of animals.

He wondered if ordinary milk, teeming with bacteria, would be a suitable commodity for canning? If the milk were thoroughly sterilised or boiled, it might be advantageous to can it. He would like to know more on this point.

Professor Craig's remarks were very informative and he felt that the Professor must have gone to considerable trouble to collect the information. Probably one of the reasons why so few horses were affected by gas in comparison with gunshot casualties, was because the majority were stationed behind the lines, but it was plain that where horses were in the vicinity of shell holes and craters they were badly affected.

There should be in each area a certain body of men specially detailed to carry out general anti-gas work for animals, and it seemed to him that this was a most important requirement for the operations to be performed with real efficiency. One could hardly expect an owner of stock to be concerned about his stock primarily, when the lives of his family probably were at stake. Mr. Clayton concluded by stating that most of the suggestions were to some extent conjecture in the present state of knowledge and experience.

[As recorded elsewhere in this number of the *Veterinary Record,* the Lancashire Division, following the foregoing discussion, passed a resolution recommending the formation by the N.V.M.A. of a Special Committee to examine the subject at issue, and report.]

THE MEDICAL PROFESSION AND MILK

The recently-announced Government policy for milk* was made the subject of an editorial in the *Lancet* of August 7th. Commenting on the proposed creation of a permanent commission to keep watch on the production, marketing and consumption of milk, and on the modification of the arrangement by which the industry receives exchequer grants for milk used in manufacture by means of a price-insurance plan intended to protect it from the effects of fluctuations in the price of imported butter and cheese, the *Lancet* goes on to state that it is the third group of proposals that is of most direct concern to public health authorities and the medical profession. This group of proposals contains the announcement of the Government's intention that any local authority shall be able to apply to the Minister of Health or the Secretary of State for Scotland for an order requiring efficient pasteurisation of milk retailed in its area.

Concluding the *Lancet* states: "The problem of milk has hitherto been dealt with piecemeal and by legislative measures of very limited utility. It is refreshing, therefore, to find a balanced and progressive policy put forward. We welcome especially the statement that increased consumption of liquid milk can only be based on public confidence in its cleanliness and purity. This is an argument that we have constantly urged, and it is satisfactory to see not only full recognition of its importance but plans that take it into account. If advantage is taken of the powers now to be offered to local authorities this country will have gone far to put milk in its proper place as a food; and once they are sure that it will not convey disease the medical profession will confidently recommend its wider consumption."

*Milk Policy. Cmd. 5533. H.M. Stationery Office. 1937. 2d.

The Veterinary Record

September 4th, 1937.

The Identification of Tuberculin-tested Cattle

As a first step in their campaign against the diseases of cattle the Government intend to carry out a survey throughout the country of the incidence of tuberculosis in cattle. From this survey it is hoped to discover several areas where the incidence of the disease is comparatively low, and utilise these areas in an attempt to develop regions in which the cattle will be free from the disease.

In this initial survey the tuberculin test will be extensively used. The practitioner will be given the opportunity to conduct most of these tests. A certain number of confirmatory tests will undoubtedly be made by the whole-time officers. It will obviously depend to a considerable extent upon the way in which the practitioner carries out this initial survey whether or not he will be entrusted with this work in the campaign to follow.

It has come to our notice, as it must already have done to that of many of our readers, that the reliability of the tuberculin test and the reputation of the tester are not infrequently brought into disrepute. There has been some evidence in the past that certificates have been produced stating that a certain animal has passed the tuberculin test, whereas the certificate was originally issued in respect of another animal. The purchaser may then have his newly-acquired animal tested and find it to be a reactor. He will be fortunate if he has escaped further harm through extension of infection within his herd. The evidence before us is even more serious, for it would appear that certain interested persons have access in some way unknown to a stock of these spurious certificates which they readily issue with animals as desired. We must here acknowledge that no reputable dealer would consider adopting such a procedure.

Every effort should be made at once to stamp out these abuses. It is clear that all animals tested ought to be marked or branded by the veterinary surgeon. The markings should be easily decipherable. It is essential that great care should be taken not only in performing the tests but in ensuring that the certificate issued refers to the animal tested and to no other. If these steps are not carried out, the veterinary surgeon may incur loss of reputation. The profession must expose relentlessly all practices which reflect upon the integrity of its members and the reliability of its work.

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CLINICAL COMMUNICATIONS

Tuberculosis in the Dog

A. E. CAREY-FOSTER, M.R.C.V.S.
Bexleyheath

Subject.—Wire-haired, male fox-terrier, four and a half years old.

History and Symptoms.—The dog had had a chronic cough for some months at irregular intervals. It was emaciated and had alternating periods of brightness and extreme dullness.

On examination the temperature was found to be 103·8° F. and auscultation of the chest revealed the presence of some very dull areas. There was no evidence of any pleuritic fluid.

I strongly suspected tuberculosis and applied the double intradermal test, injecting 0·1 c.c. old concentrated tuberculin into the neck site. The resultant swelling was hot, very painful and measured 14 mm. as opposed to 2 mm. normal reading.

The dog was destroyed, but I was unable to make a *post-mortem* examination as the owner wished to have the carcase for reasons of sentiment.

I thought this case might be of interest, firstly because of the comparative rarity of this disease in dogs and secondly because of the success of the test.

Delicate questioning elicited the information that the owner's husband had a chronic cough.

* * * * *

Pancreatic Disease in a Bitch

H. KIRK, M.R.C.V.S.
London

A Dalmatian bitch aged five years was presented for diagnosis in March of this year, having been very ill since last December. It had been under somebody's treatment during the intervening months, with no success whatever. The diagnosis of the practitioner was "worms in the blood stream," for which nemural had been given, and hundreds of what the owner described as maw worms were said to have been passed in the motions. The bitch gradually lost flesh, and became terribly emaciated and weak; in fact, when presented to the writer, there seemed to be hardly any remaining musculature, let alone fat. This skin-covered skeleton staggered about in a drunken fashion, often fell down, and was debilitated and dreadfully weak. Appetite and thirst were excessive and anaemia marked, but there was no emesis, and no pyrexia. A very characteristic symptom, however, was present, which gave an immediate clue to the nature of the malady; and that was the grey, pultaceous, rancid-smelling stools. Inspection of the dog, *plus* the history, clearly suggested diabetes mellitus, the first step in confirmation being, of course, urinary tests. The specific gravity was 1030; all tests for albumin were entirely negative and, much to the writer's dismay, three tests for sugar failed to yield a positive reaction. The case was therefore diagnosed as one of pancreatic disease not implicating the Islets.

Without pursuing other diagnostic methods, the dog was given 4 grs. of pancreatic extract daily *per os*, and placed upon a meat diet. A month of this treatment effected a remarkable change. The animal could maintain her balance, her spirits and strength greatly improved, and her weight obviously increased. At the end of two months her condition had so improved that she was discharged from hospital, the owner being instructed to give only 1 gr. of pancreatic extract daily. In June all treatment stopped, and to-day one could not discern that the bitch had ever ailed.

ABSTRACTS

[The Auditory Organ of the Ox (Bos taurus). Wilkie, H. C. *Proceedings of the Zoological Society of London.* January, 1937.]

The structure of the auditory apparatus in the ox follows the same general plan as in other mammals, but there are morphological differences which are sufficiently pronounced to enable one to identify the species even when dealing with very small fragments. Wilkie, in his latest paper on the ear, endeavours to point out these morphological differences, particularly those which are believed to be new findings.

There are many differences described, of which a few may be mentioned as examples. He states that (*a*) there is a difference in the shape of the bodies, and processes, of the ossicles; (*b*) folds of mucous membrane, inconstant in position, but continuous with that lining the tympanic cavity and reflected round the ossicles, are stretched between the drum, the tympanic walls, and the ossicles; (*c*) the chorda tympani nerve does not emerge from the glasserian fissure as in the horse; (*d*) the openings of the aquaeductus vestibuli and cochleae are easily seen on the cranial surface of the petrous temporal bone.

The author also mentions the possible pathways of infection from the middle ear, which may vary in other species due to these morphological differences. Human writers mention the layer of bone which separates the attic of the tympanum (epitympanic recess) from the middle fossa of the skull as being a common pathway of infection leading to intercranial disease. In the ox, however, this layer is thick, and composed of compact bone. The wall of bone which separates the tympanum from the vestibule at a point just above the fenestra ovalis is thin and a much more likely pathway. Again, in the human, intercranial disease may spread from the middle ear up the aquaeductus vestibuli to the meninges, *via* the labyrinth. In the ox the ducts of the labyrinth, and the lumen of the aquaeductus vestibuli are so small that infection is unlikely to spread to the cranium in this manner without an initial destruction of tissue. Another possible pathway for intercranial infection from the labyrinth may be by way of the perilymphatic duct, which has a wide passage and a fairly short course.

Drainage of pus from the middle ear by means of opening the bulla is not possible in the ox, owing to the fact that the bulla is full of spongy bone and thus the tympanic cavity does not descend into it.

C. W. O.

* * * * *

[Diseases Transmissible to Veterinarians through Contact with Sick Animals. ("Les Maladies professionnelles des Vétérinaires.") Bory, L. *Rec. Méd. vét.* **113.** 6. 342-363.]

A description is given of the clinical manifestations in man of those diseases which are transmissible to veterinarians through contact with sick animals. The diseases described are glanders, which may be acute—producing inflammation and ulceration of the skin and the respiratory tract—or chronic—characterised by ulceration of the skin; anthrax, manifesting itself as the malignant pustule, less commonly as a necrotic form and still more rarely as an oedematous form; rabies, sarcoptic mange from the dog and notoedric mange from the cat; epidermidomycosis of bovine or feline origin; cow pox and allied conditions, one of which may be contagious pustular dermatitis of the sheep, which may be transmitted to the cow and then in turn to man; foot-and-mouth disease; infectious anaemia of horses, transmitted by ingestion or by biting flies; swine erysipelas, especially dangerous when simultaneous inoculation of serum and virulent bacilli are being carried out; tuberculosis by inoculation; undulant fever as a true infection or as an allergic erythema in a subject sensitised by a previous attack which in many cases passed unsuspected; psittacosis; ictero-haemorrhagic spirochaetosis.

A. B.

['The Treatment of Respiratory Failure in Dogs Anaesthetised with Barbituric Acid Compounds, Typified by Nembutal. Morris, M. L., and Eastman, D. A. (1936.) *N. Amer. Vet.* **17.** 4. 34-36.]

The authors quote recent publications concerning a preparation, "Metrazol," which is directly antagonistic to the barbiturates, and record their own experiences with this drug. Chemically, "Metrazol" is pentamethylenetetrazol, very soluble in water and easily sterilised by heat without any decomposition. The drug stimulates the respiratory and vasomotor centres in the medulla oblongata and appears to stimulate the heart muscle directly as well as reflexly through the medullary centres. A lowered blood pressure is rapidly brought back to normal and respiratory activity is increased as to rate and depth.

The authors have administered 1 c.c. of "Metrazol" to dogs showing respiratory failure when under barbiturate anaesthesia, with excellent results. The dose can be safely repeated in two or three minutes if respiration is not restored.

It is considered that the drug has a wide field of application as a stimulant in pneumonia cases.

D. W. M.

* * * * *

[A Treatment for Scours in Calves. Shaw, J. N., and Muth, O. H. (1936.) *N. Amer. Vet.* **17.** 7. 35-38.]

Calves found to be affected with scours were treated with a preparation made by inoculating sterilised milk with a culture of *Lactobacillus acidophilus* and incubating for 24 hours. A drench of 500 to 1,000 c.c. of this was given either alone or in saline to 50 cases, and of these 34 rapidly recovered after one or more treatments, and 16 died.

G. J. G. H.

* * * * *

[Poisoning of Sheep by Copper Sulphate. Masheter, J. W. H. (1936.) *Vet. J.* **93.** 6. 215-216.]

Fifty-seven ewes, one ram and 66 lambs were each drenched in error with 2 oz. of a 10 per cent. solution of copper sulphate. Thirty-two lambs died within three and a half hours and by the morning of the following day a further 15 lambs and seven ewes had succumbed. One further lamb and one ewe died two days later. Symptoms were rolling gait or decubitus, or coma, grinding of teeth, salivation, moaning, green diarrhoea. Lambs were given 10 grains of potassium ferrocyanide in 2 oz. of water, followed by white of egg and milk every six hours. Treatment for ewes consisted of 1 oz. of linseed oil and half a pint of milk three times daily.

C. F.

REPORTS

Nottinghamshire County Council

SEVENTH ANNUAL REPORT OF THE COUNTY VETERINARY OFFICER

The report, recently issued, of the work carried out by the Nottinghamshire Veterinary Department during the year 1936-37, opens with a comment on the present uncertain position of all producers and would-be producers of tuberculin tested milk, and on the multiplicity of control over the production generally in this country. Mr. Torrance makes a strong plea for producers at present hampered and confused by the shoal of officials and regulations, in many cases conflicting in aims and ideals, but concludes on an optimistic note by saying that the near future may possibly bring forward a more simple and efficient form of administration.

The County of Nottingham is divided into four areas, each in charge of a member of the County Veterinary Staff, whose duties include the whole of the work under the Diseases of Animals Acts and Orders and under the Milk and Dairies Acts and Orders. The veterinary staff also act as advisers to officials of sanitary authorities in clearing up matters encountered by the latter during the course of their duties as meat inspectors.

Under Section 4 of the Milk and Dairies (Consolidation) Act, 1915, four reports were received from medical officers that tubercle bacilli had been found in milk produced in the county. Investigation of these cases resulted in the elimination of two cows affected with tuberculosis of the udder and two cows affected with chronic tuberculous cough.

Under the Milk and Dairies Order, 1926, all licensed milking herds in the county are examined bi-annually and as a complement to clinical examination, samples of milk from each herd, grouped for purposes of economy, are submitted to biological examination. Mr. Torrance emphasises the value of clinical examination of dairy cattle combined with the biological examination of "post-clinical" herd samples of milk and points out that the detection of animals suffering from chronic tuberculous cough results in the timely elimination of animals which might later become the subject of tuberculosis of the udder and consequently a menace from the public health standpoint. In connection with these "post-clinical" herd samples of milk it is the practice to group together the milk from several herds so that each sample will represent approximately 50 to 60 cows. This results in a considerable saving in cost, which apparently outweighs the disadvantages of having to examine several herds in those cases where a mixed herd sample of milk proves positive. Under this section, 42,255 cows were examined, 38,438 of which represented routine inspections, while the remaining 3,817 represented re-examination of cows contributing to positive mixed herd milk samples. Routine clinical examination resulted in the elimination of 59 cows affected with tuberculosis of the udder, 162 cows affected with chronic tuberculous cough and 23 affected with tuberculous emaciation, while "post-clinical" mixed herd milk sampling and re-examination of herds responsible for positive samples resulted in the elimination of 37 cows affected with tuberculosis of the udder, nine cows affected with chronic tuberculous cough and two cows affected with tuberculous emaciation. The percentage of udder cases of tuberculosis, based on the cow population, is calculated as 1·47, and when based on the number of cows examined the percentage is 0·69.

Under the Milk (Special Designations) Order, the supervision of five tuberculin tested herds was transferred from the Ministry of Health to the County Council. Six other herds have been licensed by the County Council, making a total of eleven tuberculin tested herds at present in the county. The whole of the tuberculin testing of herds is carried out by the whole-time county veterinary staff without charge to the owners and, as Mr. Torrance points out, the comparatively poor response on the part of herd owners to the helpful attitude of the County Council, is due not to apathy on the part of the owners but rather to the uncertainty as to the future prospects of producers of this high-standard milk. It has been found necessary to re-test at intervals of three months instead of the usual six months in order to pick out those animals which pass the initial tuberculin test although affected with tuberculosis in its early stages and before the animal has become sufficiently sensitised to react to tuberculin.

The report shows that there are 173 "Accredited" milk producers in the county: these herds are examined quarterly by the county veterinary staff and samples of milk from the herds are examined biologically every six months, except in the case of those herds which supply milk to schools, which latter are sampled each quarter. In this connection 703 visits were made and 13,156 cows were examined, resulting in the elimination of eleven cows affected with tuberculosis of the udder, 42 cows affected with chronic tuberculous cough and two cows affected with tuberculous emaciation; in addition, 137 cows were found to be affected with mastitis and 61 affected with other conditions detrimental to the purity of the milk supply. The examination of 125 mixed

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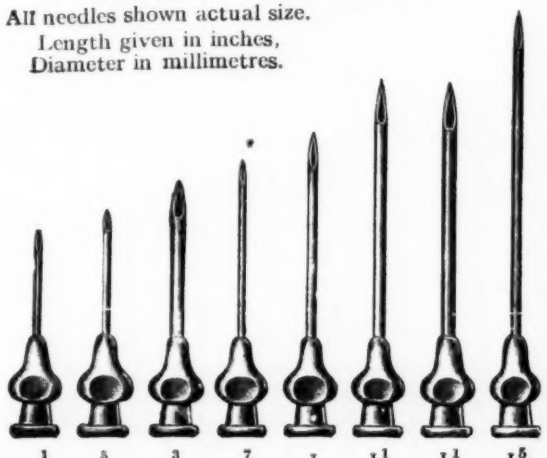

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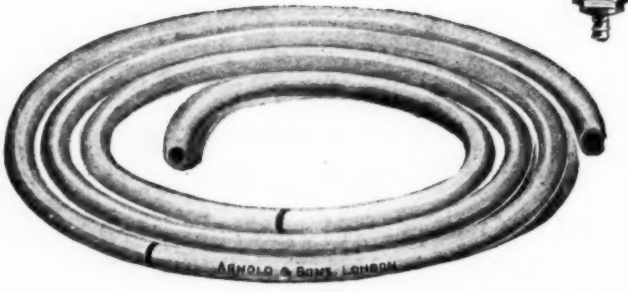

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herd samples, 13 of which proved positive, resulted in the elimination of a further ten cows affected with tuberculosis of the udder and three cows affected with chronic tuberculous cough. The bacteriological examination of accredited milks is carried out by the Veterinary Department and the report gives a summary of the tests and the standards of cleanliness laid down by the Milk (Special Designations) Order.

The second section of the report deals with the work under the Diseases of Animals Acts and Orders and it is pointed out that only those animals which fall within the categories laid down by the Tuberculosis Order can be dealt with by the local authority, other animals, although known to be tuberculous, being outside the scope of the Order. During the year 527 bovine animals were dealt with under the Tuberculosis Order, including 146 cases of tuberculosis of the udder, 330 cases of chronic tuberculous cough and 51 cases of tuberculous emaciation. The results of the *post-mortem* examinations of these animals showed that 267 were advanced cases, 259 were not-advanced cases and one animal was not affected. The total percentage of animals slaughtered under the Tuberculosis Order, based on the cow population, was 2·15, udder cases accounting for 0·59 per cent. A summary is given showing the classes of herds in which these tuberculous animals were found and the circumstances in which they were found, and a second summary shows the comparative figures for the last eleven years, since the commencement of operation of the Tuberculosis Order.

Three outbreaks of foot-and-mouth disease occurred in the county during the year, and while there was no further extension of these outbreaks the necessary restrictions imposed interfered to some extent with the routine examination of dairy cattle. Suspected outbreaks of anthrax numbered 22, three of which, involving seven animals, were diagnosed as anthrax by the county veterinary staff and confirmed by the Ministry of Agriculture and Fisheries. Only four outbreaks of sheep scab occurred during the year as compared with 17 in the previous year. These four outbreaks, which were the only ones diagnosed as a result of investigation of eleven suspected outbreaks, involved 19 affected sheep among 696 sheep examined. Arising from these outbreaks 16 "contact" flocks, comprising 571 sheep, were examined but no clinical cases of scab were found, while 22 flocks, comprising 1,354 sheep, were examined in connection with outbreaks of sheep scab in adjoining counties, but again no cases of scab were found amongst the latter.

Three suspected cases of parasitic mange in horses were reported, but all were found negative on examination.

During the year 111 suspected outbreaks of swine fever were reported by the police to the Ministry of Agriculture and Fisheries, and of these 17 were confirmed by the Ministry's veterinary inspectors.

Regular inspection of the several cattle markets in the county was carried out by the county veterinary staff, and all animals found amenable to the regulations of the Diseases of Animals Acts and Orders were appropriately dealt with. The inadequacy of facilities at cattle markets for the examination and slaughter of suspected animals is emphasised by Mr. Torrance, who points out the urgent need for the provision of better facilities by market authorities.

All microscopical examinations of milk, sputum, etc., taken in the course of herd inspections are made by the county veterinary staff, and in view of the comparative accuracy of carefully made microscopical examinations, coupled with the study of the clinical examination of the animal concerned, it was found necessary in only a few cases to submit individual samples of milk to further biological examination. During the year 1,752 individual samples of milk were examined, of which 144 proved to be tuberculous, while the examination of 1,036 samples of expectorate showed 264 to be tuberculous.

The report concludes with a series of tables giving a concise account of the activities of the Veterinary Department throughout the year.

* * * * *

County Council of Durham

CHIEF VETERINARY OFFICER'S REPORT FOR 1936

The report of the Chief Veterinary Officer, Mr. H. B. Allan, is divided essentially into two parts, the first dealing with the work under the Diseases of Animals Acts and Orders, and the second with that of the Milk and Dairies legislation.

The veterinary staff in Durham County consists of the Chief and five assistant veterinary officers, and to each of the last named is allotted a special district of the county. In addition, there is a panel of part-time veterinary practitioners on whose services and assistance the Chief Veterinary Officer can call in cases of emergency.

Under the heading of Anthrax we read that out of 32 suspected cases only two proved to be positive. This compares with five and one in the two preceding years, and considering the great increase in anthrax generally in the country, the low incidence in Durham is most satisfactory.

There was no outbreak of foot-and-mouth disease during the year, although two suspected cases were investigated by the staff.

Sheep scab shows a welcome decrease with only nine outbreaks as compared with 30 in 1936. Altogether 117 sheep were actually affected with scab, and in connection with these outbreaks 37 flocks were visited and 2,888 sheep submitted to a veterinary examination. In the general preventive measures taken against this disease some 382 flocks were rounded up and 72,912 sheep examined by the veterinary staff and double-dipped. Supervision of dipping was left in the hands of the police.

In contrast to the practice in most county veterinary services, diseases of poultry are accorded a definite place in the activities of the Department, and co-operation is given to the County Poultry Instructor. A number of visits were paid by a member of the veterinary staff to various centres in company with the last-named official. *Post-mortem* examinations were carried out on 65 birds at the veterinary laboratory situated at headquarters.

The usual details of the work under the Tuberculosis Order of 1925 are given. Out of 405 animals found to come under the provisions of the Order, 275 were detected by the staff on routine examination of dairy cows, 104 were reported by their owners and 26 by private veterinary practitioners. Of these, 126 were affected with tuberculosis of the udder, and no less than 100 of this total were noted on routine examination by the staff. All cattle slaughtered appear to be sent to the knackers, who pay 15s. per carcase. With so many cattle affected with udder tuberculosis, many of which must doubtless be taken in comparatively early stages of the disease, it is surprising that some of the cattle are not sent to butchers and the meat marketed when it is found to be fit for human consumption.

Johne's disease appears to be a somewhat rare condition in Durham, but mastitis, as is to be expected, is only too common. It is hoped to give a series of lectures to young farmers on this condition. Two hundred and twenty-four visits were paid to markets by the staff, but the class of cattle exposed in these markets appears to be very satisfactory and only two cattle were dealt with under Article 12 of the Tuberculosis Order.

Milk and Dairies Legislation.—The veterinary staff paid 5,186 visits to registered milk-producing farms and carried out 47,507 clinical examinations of cattle thereon. There were 13 complaints under Section 4 of the Milk and Dairies (Consolidation) Act, 1915, and in no less than twelve cases the guilty cows were detected and slaughtered. During the year 345 samples of "Accredited" milk were submitted to the biological test, and only nine, or 2·6 per cent., were found to contain living tubercle bacilli. In six cases the affected cows, eight in number, were detected and slaughtered and in the remaining three instances it was found that a diseased cow had been removed from the herd and slaughtered previous to the veterinary visit. The very high percentage of successful investigations is not only creditable to the veterinary staff, but also shows the accuracy of the biological tests as carried out in Durham, an accuracy unfortunately not found to exist in all counties. The veterinary staff examined 2,104 samples of various sorts in the laboratory at headquarters; these included 1,144 milks and 661 samples of sputum. In most cases the district officers do not do their own microscopic work, but prefer to send their samples to the central veterinary laboratory attached to the headquarters.

There are now 23 farmers licensed to produce tuberculin tested milk against 13 the year before, and 263 licensed to produce accredited milk against 164 at the corresponding period of 1935. A sampling officer attached to the Medical Department takes about four samples a year from each producer so licensed. Milk from each accredited farm is submitted to the biological test twice a year.

The report, which ends up with three tabular appendices indicating the incidence of disease in the county during the last eleven years, the results of dairy inspection carried out in the county during the year 1936 compared with the previous year, and a statement showing the various types of milk producers in each sanitary district in Durham, shows the good work carried out by Mr. Allan and his staff.

THE NATIONAL VETERINARY SERVICE

Inquiries regarding all the county veterinary services are being made by the Ministry of Agriculture in connection with the establishment of the National Veterinary Service, which is expected to come into operation in January. Under the new scheme many of the duties at present carried out by the county authorities will (as previously announced in these columns) be transferred to the new service. These include the administration of the Tuberculosis Order, the routine veterinary inspection of cattle, the diagnosis of certain diseases, and the veterinary inspection of markets.

In preparation for the establishment of the new service, and for the big drive the Government is planning against livestock diseases, the Agricultural Research Council and the Medical Research Council are co-operating in pooling the whole of the available knowledge in regard to tuberculosis and other diseases. It is claimed that the National Veterinary Service will enable much more intensive methods of dealing with livestock diseases to be applied than has been possible hitherto.

REVIEW

["Esperimenti di Vaccinazione Anti-Tubercolare" (Experiments on Vaccination Against Tuberculosis). A. Ascoli. (1937.) Report from the Anti-Tuberculosis Vaccination Institute, Milan. pp. 296. Eigli: Milan. Price L. 100.]

In 1932 a technical committee was formed to control a series of experiments designed to test the value of B C G and other vaccines under various conditions. These experiments, which were initiated by the Anti-Tuberculosis Vaccination Institute of Milan directed by Professor Ascoli, were undertaken at various agricultural stations in Northern Italy. The results, as they have become available, have been published as separate articles in *Patologia Comparata della Tubercolosi*, but the complete series has now been collected and analysed in the volume under review.

The book is divided into sections, each of which contains full details of a self-contained investigation into a particular aspect of the problem, *e.g.*, the effect of intravenous doses of virulent tubercle bacilli on calves, the efficacy of B C G for calves exposed to infection by co-habitation, etc. The general outline of each experiment is tabulated, followed by protocols of vaccination, methods of infection, *post-mortem* findings and biological tests on individual animals. Each section is completed by a summary of the result in Italian, English, French and German.

In all, 94 calves were used in these experiments, the majority of which were designed to test vaccines by the intravenous route. The general conclusions which have been deduced from the experiments are as follows: Vaccination with dead bacillary emulsions (dead B C G or human strains) was of little value in preventing infection either by the intravenous inoculation of a comparatively large test dose or by co-habitation with known infected animals. On the other hand, living B C G or living human strains injected either intravenously or subcutaneously were capable of affording a high degree of immunity against infection by contact, especially when the vaccinal doses were repeated at comparatively short intervals. It is pointed out that in order to ensure success, it is necessary to protect vaccinated animals from infection for a short time, as exposure before an adequate degree of immunity has been established may result in the development of natural lesions.

Unfortunately, the value of many of these experiments was vitiated by the fact that there was a strong suspicion in the earlier experiments (intravenous tests) that the animals may have acquired a spontaneous infection before receiving the test dose.

The book can be recommended to those who are interested in the use of B C G as an immunising agent for cattle.

International Veterinary Congress

MEETING OF THE PERMANENT COMMITTEE

A meeting of the Permanent Committee of the International Veterinary Congresses was held on Saturday, October 24th, 1936, in the Senate Hall, University of Berne.

There were present—from the office of the Permanent Committee: Messrs. Leclainche (France), Stang (President, Germany), de Blieck (Vice-President, Holland), Kelland (Secretary and Treasurer, England) and the Assistant Secretary; other members: Messrs. Kasper (Austria), Petersen (Denmark), Marczewski (Poland), Sven Wall (Sweden) and Pfaff (Czechoslovakia).

Apologies for absence were received from Messrs. Farid Bey (Egypt) and Miranda do Vale (Portugal).

Absent: Messrs. Mohler (U.S.A.), du Toit (South Africa), Beyro (Argentine), Douglas Stewart (Australia), Rubay (Belgium), Hermsdorff (Brazil), Angheloff (Bulgaria), Hilton (Canada), Crespo y Garcia (Cuba), Sanz Egana (Spain), Eichhorn (U.S.A.), Preston Hoskins (U.S.A.), Kankaanpaa (Finland), Craig (Ireland), Figueroa (Mexico), Holth (Norway), Reakes (New Zealand), Ionesco-Braila (Rumania), Nouri Bey (Turkey), Skrjabine (U.S.S.R.) and Guetz (Yugoslavia).

In place of those absent, the following attended the meeting: Messrs. Duerst (representing Dr. Steck, Switzerland), Dr. E. Graeub (representing Professor Dr. Frey, Switzerland) and Dr. White (representing Dr. Mohler, (U.S.A.).

Professor Dr. R. Manninger (Hungary) was also present.

The President declared the meeting open and welcomed members and substitutes.

Professor Dr. Duerst, Rector of the University of Berne, welcomed all those present.

The General Secretary read his report on the work of the committee during the period August 13th, 1934, to October 24th, 1936. This report was approved and will be circulated to members.

The following were proposed as members of the Permanent Committee: Professor Dr. H. K. Sievers Wicke, Director of the Veterinary Research Institute, Santiago, Chile (nominated by the Ministry of Agriculture, Chile); Professor

Dr. R. Manninger, Professor at the Veterinary High School, Budapest, Hungary (nominated by the Hungarian Veterinary Medical Association); Dr. A. Baldomir, Director of the Veterinary Service, Montevideo, Uruguay (nominated by the Permanent Committee).

These nominations were accepted.

Italy and Japan, who have at present no delegates, made no nominations. However, Professor Glueckiger (Switzerland) has received a letter from Professor Dr. Bisanti (Italy), together with a list of reporters proposed by the Italian National Committee. According to this letter, the question of the acceptance of the Italian language as an official language of the Congress would be brought up later, *i.e.*, at the Zürich Congress.

Agenda for the 1938 Congress

The drawing up of an agenda for the Congress at Zürich-Interlaken in 1938, proposed by the Office of the Permanent Committee and the Swiss Executive Committee, was discussed by the meeting, taking into account the expressed wishes of the different countries.

After discussion, the following draft agenda was adopted:—

General Sessions.

I./1. Veterinary education under modern requirements.
2. The importance of the veterinarian in animal husbandry and in the production of food products of animal origin.

II. General conditions in the origin and development of infectious diseases.

III. Disturbances in animal reproduction.

Sectional Meetings.

Section I: Internal Medicine and Surgery

1. Recent progress in haematology of animal diseases.
2. Recent researches regarding the influence of feeding on the development of diseases.
3. X-ray diagnosis.
4. The present status of anaesthesia.

Section II: Infectious Diseases

1. The value of tuberculin testing in the control of tuberculosis.
2. Aujeszky's disease (pseudorabies).
3. Swine influenza.
4. Control of "Salmonellosis" in animals.

Section III: Cattle Diseases

1. Malignant catarrhal fever and similar diseases.
2. Leukosis of cattle and other domestic animals.
3. Newer researches on specific infections of the reproductive organs of cattle.
4. Surgical demonstrations on cattle.

Section IV: Parasitology and Parasitic Diseases

1. Parasites of wild animals.
2. The relation between parasitic diseases of man and animals.
3. Pasture hygiene with respect to parasitic diseases.
4. Immunity and immunity reactions in parasitic diseases.

Section V: Tropical Diseases

1. Recent research regarding tropical and subtropical diseases.
2. Geographical distribution of tropical diseases.

Section VI: Poultry Diseases

1. Lymphomatosis.
2. Blackhead.
3. Coccidiosis.
4. Psittacosis.

Section VII: Zootechnics

1. Growth and early maturity.
2. Constitution of domestic animals from the anatomical, physiological and hygienic point of view and its relation to working capacity.
3. Influence of climate on the constitution, power of resistance and working capacity of domestic animals. Acclimatisation.
4. Artificial insemination.

Section VIII: Meat Inspection and Milk Hygiene

1. The inspection of tuberculous animals for slaughter.
2. Bacterial and non-bacterial, physical and chemical changes in meat.
3. Estimation of the value of milk from an hygienic point of view.
4. Modern methods of stunning slaughter-animals.

Section IX: Military Veterinary Organisation

1. Protection against gas and therapy of gas injury of animals.
2. Prevention of animal diseases under war-time conditions.

Section X: Veterinary Physiology

1. Physiological fundamental principles for the feeding of domestic animals.
2. Physiology of the udder.
3. Newer researches into the physiology of the first stomach of ruminants.
4. Newer researches in the physiology of heredity.
5. Influence of gonadotropic hormones on the sexual apparatus of domestic animals.

In connection with the sections, the national committees of the different countries (South Africa, Germany, England, Austria, Belgium, Brazil, Canada, Denmark, U.S.A., France, Hungary, Italy, the Netherlands, Poland, Rumania, Sweden, Switzerland and Czechoslovakia) have proposed a great number of reporters, from which the Permanent Committee and the Berne Executive Committee have made a selection. Several countries have made no proposals.

The Executive Committee has decided to allow a maximum of 110 reporters. Of that total, 102 reporters have already been nominated. Eight places have been reserved for countries who may make late nominations.

Dr. du Toit (South Africa) proposed that resolutions should first of all be submitted to a special committee, since at London and New York there was not time to discuss the resolutions.

The General Secretary proposed the acceptance of this suggestion, specifying that the Resolutions Committee shall be nominated at

the first meeting of the Permanent Committee at Zürich and shall be composed, in addition to the General Secretary, of some members of the Permanent Committee.

The Resolutions Committee will present its report to the last meeting of the Permanent Committee, after which the resolutions will be published in order that they may be voted upon at the closing meeting of the Congress. In this way it will be possible to avoid belated proposals which cannot be accorded mature judgment.

The General Secretary explained that the stipulations comprised in Article 45 of the Statutes of the International Veterinary Congresses had never been carried out. These laid down that:—

> "The documents and other articles concerned with the International Veterinary Congresses are to be retained by the Secretary of the Permanent Committee and entered in a register *ad hoc*. If a secretary resigns, he is to hand the archives to his successor. In case of death, the President of the committee should see to their transmission."

It would be preferable that these documents should not leave the country in which the Congress is held and Article 45 should be modified as indicated in the agenda, para. 6.

The meeting accepted this proposal and the Thirteenth International Veterinary Congress will accordingly be asked to modify Article 45 in this way.

The General Secretary drew attention to a letter from the Organising Committee of the Twelfth International Veterinary Congress, New York, from which it appeared that there was an excess sum of $10,133.84. This surplus arose from the funds mentioned in Article 47, section (*b*) of the Statutes of the Congress. There was no excess from funds mentioned in Article 47, section (*a*).

Article 47 said: "The revenue of the Congress is derived from (*a*) the contributions of the members (Article 12); (*b*) the grants of authorities, societies and individuals.

"The funds under (*b*) shall not, however, be subject to Statutes 48 and 50, unless the contributors stipulate to the contrary, but the Permanent Committee may, if it so decides, ask for a part of the surplus under (*b*), not exceeding the sum of £20 sterling, to be voted to the costs of administration of the Permanent Committee."

According to Article 47, para. 2, the Organising Committee had the power to allocate the surplus of funds under (*b*).

The General Secretary was of opinion that a change should be made in this rule so that there was no distinction in the allocation according to the source of the funds available to the Congress and that the Organising Committee, together with the Permanent Committee, might be able to allocate the final surplus as laid down in Article 48, para. 3 of the Statutes of the Congresses. Before 1914 no distinction was made between sections (*a*) and (*b*). To this end it would be necessary to modify Article 47 so that the second line was deleted.

The meeting expressed assent. The Permanent Committee will move accordingly at the next Congress, to be held at Zürich, in order to secure a definite ruling on the matter.

The Organising Committee of the New York Congress has allotted the surplus as follows:—

> A sum of $3,000 will be deposited with the Treasurer of the American Veterinary Medical Association. The income therefrom, accumulated during the intervals between the International Congresses, will constitute a cash prize to be known as the "U.S.A. Twelfth International Veterinary Congress Prize." It shall be awarded, by each International Veterinary Congress, to the veterinary author of the most important contribution to veterinary science since the previous Congress. Nominations shall be made to the Permanent Committee at the meeting held to draw up the programme for the next International Veterinary Congress. The Permanent Committee shall select the winner of the prize at a meeting to be held during the course of the Congress, and he shall be awarded this at the closing meeting of the Congress.

The Permanent Committee was asked to designate the candidates for the International Prize to be known as the U.S.A. Twelfth International Veterinary Congress Prize.

In view of the existence of the Budapest Prize, the General Secretary proposed that the available sum should form a bursary instead of allocating it for another prize and that the proposal should be submitted to the Organising Committee at New York. This bursary would allow European veterinarians, who would be carefully selected, to spend some time in the U.S.A., or, on the other hand, American veterinarians might visit Europe.

Dr. White is to transmit this proposal to the New York Organising Committee.

Dr. du Toit (South Africa) has intimated that he will undertake to draw up the Latin nomenclature of diseases of animals and submit it to the Zürich Congress in 1938.

The meeting accepted this proposal with appreciation.

The agenda being completed, the President thanked those present for their assistance and declared the meeting closed.

Professor Dr. E. Leclainche,
President.

Professor Dr. L. de Blieck,
General Secretary.

N.V.M.A. DIVISIONAL REPORT

Lancashire Veterinary Association*

MEETING AT LIVERPOOL

A General Meeting of the Association was held in the Department of Animal Pathology, University of Liverpool, on Friday, May 21st, 1937, at 2.30 p.m. The chair was occupied by the President, Mr. H. Sumner, and others present were Messrs. N. M. Clayton, G. C. Webster, E. J. Burndred, H. R. Hewetson, W. Woods, A. L. F. Mullen, H. T. Matthews, G. O. Davies, J. Holroyd, E. H. Curbishley, F. A. Ball, H. G. Hewetson, G. Mayall, A. B. Mattinson, J. Cubby, W. Fowle, R. J. Thomas, P. T. Lindsay, J. W. Wilson, A. H. Leyland, A. Ratter, J. C. Baird, G. Shirley and Miss P. Stubbs. Miss C. A. Woods and Messrs. J. F. Craig, R. F. Creasey, A. J. E. Needlam and R. R. Setterfield were present as visitors.

Apologies for absence were received from Messrs. H. Burrow, R. Hughes, Sir F. T. G. Hobday, Messrs. G. H. Locke, R. C. Locke, C. F. Shawcross and W. F. Morton.

The minutes of the previous General Meeting, having been published in the *Veterinary Record*, were taken as read.

Correspondence.—(1) From Major A. B. Mattinson, thanking the Association for its support in the forthcoming Council Election of the Royal College of Veterinary Surgeons.

(2) From Mr. G. H. Locke, expressing appreciation of the honour conferred upon him by the Association in electing him an Honorary Associate Member.

(3) From the Secretary of the Royal Sanitary Institute, inviting the Association to appoint delegates to the Congress to be held at Birmingham from July 12th to 17th. It was resolved "That the procedure adopted in other years be repeated this year, namely, that the Association be represented by members who intend to be present."

Nominations for Membership. — Mr. G. C. Webster nominated Mr. R. N. Clunie, of Lancaster, and Mr. J. Holroyd Mr. J. F. D. Tutt, of Winchester; Mr. E. A. Pearce, of Frodsham, was nominated by Mr. A. L. F. Mullen, and Miss E. H. Patchett, of Chorlton-cum-Hardy, by Mr. J. C. Baird.

Council Report.—The report of the Council Meeting, which was held at the Grand Hotel, Manchester, on March 10th, 1937, was read and approved.

Representatives on the Council of the National Veterinary Medical Association, 1937-38.—On the proposition of Mr. E. J. Burndred, the President (Mr. H. Sumner) was elected to represent the Division on the Council of the N.V.M.A. for the year 1937-38, other members elected to the Council being the Hon. Treasurer (Mr. R. C. Locke) and Messrs. G. C. Webster and T. Wilson.

Interim Report of the Organising Committee for the Annual Summer Meeting.—In this report it was stated that two meetings of the sub-committee appointed to organise the Summer Meeting of the Association had been held, and the arrangements to date were detailed. Mr. E. J. Burndred stated that the Congress of the Royal Sanitary Institute was to be held during that time, but after discussion it was decided that the date of the meeting remain unaltered.

Paper.—The President, Mr. H. Sumner, then called upon Mr. N. M. Clayton, M.R.C.V.S., of Birkenhead, to present his address "Anti-Gas Precautions: Points of Interest to the Veterinarian." [Mr. Clayton's paper, and a report of the discussion which followed its presentation (opened by Major Mattinson) are reproduced earlier in this issue.—*Editor.*]

The President thanked Mr. Clayton for his impressive review of the subject, and said that they were very grateful to him for the care he had taken in presenting the paper. It appeared, he said, that gas warfare was no more pleasant than before, but he was glad that apparently something was being done to combat some of its horrors.

Vote of Thanks.—Mr. A. L. F. Mullen said that it gave him great pleasure to propose a vote of thanks and appreciation to Mr. Clayton. He was to be thanked both for his able presentation of a novel and difficult subject and his sympathetic handling of a somewhat unwieldy discussion. It was quite obvious that Mr. Clayton must have been a very diligent pupil at the lectures he had attended; it was equally apparent that from the trouble he had gone to in preparing his subject and presenting it, he had the qualities of an ideal lecturer. It was the first time the "Lancashire" had had the pleasure of hearing Mr. Clayton and it was sincerely anticipated that it would not be the last.

Mr. H. R. Hewetson, seconding the vote of thanks, said he fully endorsed Mr. Mullen's remarks. He considered that local authorities should be in a position to deal with any emergency that might arise. They, as veterinary surgeons, knew very little about the subject so far as the protection of animals, etc., were concerned, but Mr. Clayton had done a great deal that afternoon in dealing with the situation in his most interesting and instructive address.

Replying to the vote of thanks, Mr. Clayton thanked the meeting for its patient hearing,

*Received for publication June 30th, 1937.

and said that he was sorry he could add no more to what he had already put forward. It was possible that in six months' time he might have dealt with the subject in an entirely different maner, and have had a good deal more information.

Resolution.—Mr. H. T. Matthews then rose to say that he considered the meeting should not leave the matter where it stood at present, and felt that they should adopt the suggestion that a committee should be formed to enquire into the whole position as related to animals and foodstuffs for human consumption. He considered that the question was one which not only concerned the "Lancashire" but also the profession in general, and that a resolution should be sent to the National Veterinary Medical Association.

Mr. J. Holroyd also spoke in support of this view.

The following resolution, duly proposed and seconded, was put to the meeting and carried unanimously:—

> "That this meeting, being impressed by the lack of information on the measures which should be adopted for the protection and treatment of animals subjected to gas attack and the precautions which can be taken to prevent contamination of the food supply of the human population, recommends the formation of a Special Committee of the National Veterinary Medical Association, to examine into the subject and report."

A. L. Mullen, *Hon. Secretary.*

SLEEPING SICKNESS RESEARCH

The recently-issued report of the Colonial Development Advisory Committee—shortly to be reviewed in these columns—pays a warm tribute to the research work of Dr. J. F. Corson on *Trypanosoma rhodesiense* at Tinde, Tanganyika. This work, it is stated, has been in progress for a number of years, and the immediate issue raised by it is the relation of human trypanosomiasis to the disease in domestic animals in a wild state and the part which may be played by such animals as reservoirs of sleeping sickness infection.

In the course of a number of experiments directed towards establishing the transmissibility or otherwise of infective trypanosome strains through animals to man, Dr. Corson, his assistant, Mr. H. C. Smith, of the Veterinary Department, and an African assistant, have exposed themselves to the bites of infected flies or to inoculation from infected animals. As a result, Dr. Corson and the African assistant developed sleeping sickness, thus proving that certain strains of *Trypanosoma rhodesiense* had not lost the power to infect man through a stay of a lengthy period in the bodies of animals. This research, the report adds, is likely to benefit not only Tanganyika, where the disease is one of the greatest obstacles to the development of large areas of the country, but other parts of the Empire.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Sept. 13th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.

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PERSONAL

Birth.—On July 22nd, to Mrs. K. W. Llewellyn-Jones (née Shedlock), M.R.C.V.S., "Hafod," Hawarden, near Chester, a daughter.

* * * * *

R.C.V.S. OBITUARY

Urquhart, Kenneth James, Captain late R.A.V.C., 35, Bowes Road, Palmer's Green, N.13, graduated Edinburgh, April 18th, 1883. Died August 25th, 1937; aged 75 years.

Captain Urquhart, who had, for many years, rendered innumerable practitioners valued service as locum tenens, passed away suddenly following a seizure. We deeply regret the loss to the profession of a very efficient practitioner to whose capable hands his fellow members were happy, from repeated experience of his worth, to delegate their responsibilities while on holiday.

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Erratum.—We regret that in the notice of the 1936 Report of the County Veterinary Officer, County of Renfrew, which appeared in our last issue (p. 1120), it is incorrectly stated in line six that there are "two whole-time assistants and one temporary assistant" in the Department. This should read "one permanent whole-time assistant and one temporary whole-time assistant."

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AUSTRALASIAN MEDICAL CONGRESS: MEASURES TO COMBAT TUBERCULOSIS

One of the outstanding discussions at the recent Australasian Medical Congress (says the Adelaide correspondent of *The Times*) was on measures to combat tuberculosis.

Dr. Holmes, Senior Medical Officer of the Commonwealth Department of Health, advocated the appointment of a full-time director in each State, with adequate powers and facilities. The clinic system should be the basis of all efforts. Although the rates of infection and mortality were now much lower in Australia, nevertheless the high death-rate persisting among women between 20 and 30 could not be viewed with equanimity. With Australia's great natural climatic advantages, and her relatively high standard of living, the whole position was unsatisfactory. Australia's preventive measures were incomplete, ill-balanced and piecemeal.

Last year 2,836 persons died, more than half of whom were under 45. The cost to the Commonwealth and State Governments in pensions and treatment was over £1,000,000 annually. He believed that measures directed to the total eradication of tuberculosis would cost less in the next 20 years than was now spent in partially checking the disease. By action now Australia could expect eradication within a generation.

Dr. Cotter Harvey, of New South Wales, said it was extraordinary how persistently the public clung to the belief that tuberculosis was hereditary despite the absence of any supporting scientific evidence. One conclusion which could be drawn from recent investigations in Wales and England was that young women were living too strenuously. It was scarcely credible that only 12 per cent. of patients in England were diagnosed at an early stage, which was the primary line of attack, and Australia could show better figures. An X-ray survey of selected groups would be the most profitable advance in preventive medicine, provided the utmost care were taken in interpreting the films.

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WORLD DAIRY CONGRESS: THE DAIRY BULL

Addressing the Eleventh World Dairy Congress, which was held in Berlin during the past week, Mr. James Mackintosh, of the National Institute for Research in Dairying, Reading, described the official milk recording scheme of England and Wales, and the work of agricultural and breed societies in collecting records of production.

Mr. Mackintosh said the experiences of many breeders and researchers into the genetics of milk production had definitely proved that the most successful method of improving milk yields by breeding was by the use of aged bulls whose value has been shown by the production records of their daughters. The herd system of milk recording practised in Britain was well suited to the collection and study of the progeny records of bulls. But the breeder required not only the records but also accurate information on the identity of the daughters, on the age at calving and on the frequency of milking and on other points. Further, the records of a sufficient number of unselected daughters must be available to provide a reliable basis for judgment of the bull's breeding qualities. Breeders should also learn as much as possible of the conditions under which records were made. Where dam-daughter records were thought desirable, full information was also necessary regarding the dam's records, otherwise the inferences from the records might be misleading.

Messrs. A. D. Buchanan Smith and O. J. Robison pointed out that whereas a good sire raises greatly the yields of those of his daughters who are out of low-producing dams, yet, when he is mated to high-producing cows, it is rare that any of his daughters exceed their dams. They suggested that the difference between a 1,500 and 2,000 gallon cow may be largely a question of management, whereas the difference between a 600 and a 900 gallon cow may rather be due to the hereditary constitution. In other words, it is probably easier to push a 1,500 gallon cow up to 2,000 gallons than to push up a 600 gallon cow to 900 gallons.

The first stage of an experiment on the protein requirements of dairy cows was described by Messrs. S. Bartlett, S. L. Huthnance and James Mackintosh, of the National Institute for Research in Dairying. Five hundred cows, on 18 farms, have been used in the experiment.

The results indicated a slightly greater rise in milk yield on the part of the cows which had received low protein mixture when turned out to pasture in the spring.—*The Farmers' Weekly.*

ACIDOSIS AND OFF-FLAVOURED MILK

In a letter to the Editor of *Nature*, published on August 21st, H. Barkworth and L. W. L. Cole, of the South-Eastern Agricultural College, Wye, Kent, point out that veterinarians have assisted in explaining one cause of taint of milk when showing that in cases of acidosis the body fluids, including the milk, contain acetone and acetone-bodies. It was stated that the milk would react to Rothera's test.[1]

As a result of recent experiences with samples of milk from cows suffering from acidosis, this very simple test can be commended to the dairy industry (it appears at present to be quite unknown) as a rapid and certain means of diagnosis, offering an explanation of many cases where the milk is mildly but, to a skilled palate, definitely of abnormal flavour even at the time of milking. Such cases have hitherto been somewhat vaguely ascribed to "indigestion." Furthermore, the writers find that for more accurate work, quantitative estimations may be made by the method of Van Slyke.[2] Several samples from cows giving tainted milk have been so examined, and in addition more than 98 per cent. recovery has been obtained from samples of milk to which small amounts of acetone have been added.

[1] Beaumont, G. E., and Dodds, E. C. "Recent Advances in Medicine." (1931.) p. 70. (Sixth edition).

[2] Van Slyke, D. D. (1917.) *J. Biol. Chem.* 32. 3. 455.

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THE REPAIR OF ANAEMIA

"In health the blood is maintained with surprising constancy at a level of about 5,000,000 red cells and 100 per cent. of haemoglobin per c.mm.," states an annotation which appeared in the *British Medical Journal.* "Assuming a span of life of 25 days, calculation shows that some 200,000 old red cells must die and 200,000 new red cells must enter the circulation every day. Anaemia may result from an increased rate of destruction or a decreased rate of production of red cells or from a diminution in their length of life. In pernicious anaemia the poverty of the blood and the megaloblastic degeneration of the bone-marrow are nowadays attributed to a decreased rate of production of red cells from lack of essential principles. There is a close correlation between the degree of anaemia, the extent of hyperplasia of the bone-marrow, and the height and duration of the reticulocyte crisis on the inception of treatment with optimum doses of liver or other effective substances[1]. Mathematical formulae have been devised whereby the expected reticulocyte crisis can be calculated, and such formulae are of value in testing therapeutic preparations. The anaemia which follows a sudden fall in the number of circulating red cells, as from a haemorrhage or a crisis of haemolysis, is repaired spontaneously within a few weeks and we have been accustomed to attribute this repair to an increase in the rate of erythropoiesis. Such an increase could be explained either by a more rapid maturation of the cells through the stages of erythroblast and reticulocyte to mature erythrocyte, which seems *a priori* improbable, or by an increase in the amount of haemopoietic tissue, which is in fact confirmed by pathological findings. This explanation is challenged by Schiodt[2], who has made careful observations on

[1] *Physiol. Rev.* (1937.) 17. 291.
[2] *Amer. J. Med. Sci.* (1937.) 193, 313, 327.

blood regeneration in man after haematemesis and melaena. He finds that there is a distinct correlation between the minimal blood count and the daily rise in red blood cells. The more the patient has bled the faster the blood mounts, and all the curves, though starting at different levels, tend to meet at the level of 4·54 million red cells per c.mm. about 40 days after the haemorrhage. This phenomenon, and especially the straight line character of the curves, could quite simply be explained by assuming that the rate of blood formation and the longevity of the red cells remain constant. The number of red cells removed from the circulation by death, however, is directly proportional to the total count. If the red cell count falls to 2·5 million only 100,000 red cells will die every day, and there is, therefore, a natural surplus of 100,000 to correct the anaemia. The theory is perhaps too ingenious, and it does not explain the reticulocyte crisis and the hyperplasia of the bone-marrow which accompany a haemorrhagic or a haemolytic anaemia. But if the rate of production of red cells is actually accelerated for a time it is surprising that repair does not more often overshoot the mark and produce an erythrocytosis. Moreover, one would have expected a sigmoid curve rather than the straight line that Schiodt found. Schiodt's patients were treated by Meulengracht with early feeding. Iron and blood transfusion had no obvious effect on the rate of repair of the anaemia, but it was retarded by fasting or a strict ulcer cure. It is also possible that the use of alkalis may have acted as a check to the attainment of the normal level of 5,000,000 red cells during the period of observation.

* * * * *

SOURCES OF VITAMINS

It is certain that D. is the most commonly deficient vitamin in the British diet, followed by A, C, B_1 and B_2 in that order, states V. H. Mottram, in the July issue of the *Practitioner*. He adds that if a diet is satisfactory as regards D, A and C, it is satisfactory as regards B_1 and B_2, particularly if the common articles of diet are used. It is possible by means of concentrates to produce a diet rich in A, C and D, which might be deficient in B_1 and B_2, but if the normal sources of these vitamins are relied on, and more particularly if care is taken to obtain a reasonable amount of animal protein, there is no risk of a deficiency of the vitamins. The following particulars are given of the natural sources of the vitamins and the proportion present, expressed where possible as international units.

Vitamin A.—The best sources are dairy products, yellow fruits and vegetables. The numbers of international units present in some of these foods are as follows: Milk 292 per 100 gm. (1,600 per pint); butter, 5,000; Cheddar cheese, 3,700; eggs, 1,500-4,600 (*i.e.*, 750 to 2,300 per egg); broccoli tops, 25,000 to 42,500; kale, 36,000; spinach, 20,000; turnip tops, 7,500 to 10,000; apricots, 4,500-12,000; carrots, 4,000; dried peaches, 2,200-6,000; sweet potato, 3,600.

Vitamin B_1.—Yeast and wheat germ are the best sources, but variable in amount. As much as 23 units per gm. and as low as 6·0 are found; whole wheat and oatmeal contain about 3 units per gm. Most fruits, vegetables and meats run to about 0·5 unit per gm., but meats derived from the pig have a much higher figure (*i.e.*, 2 to 3).

Vitamin B_2.—Liver and yeast head the list, then follow the dairy products and the green leaf vegetables—broccoli tops being an especially good source. No natural food, not even the apple, seems devoid of vitamin B_2.

Vitamin C.—The best sources are the raw summer fruits, the raw salad vegetables and the citrous fruits. Cooking and canning do not result in as much destruction as was thought, though much of the vitamin C passes into the fluid, and if the latter is discarded, such processes result in a large loss. The following figures give the amount of fruits and vegetables which supply 30 mgm. of vitamin C (or rather, ascorbic acid), in the number of ounces stated; this quantity being reckoned sufficient for a day's ration: Black currant, ½ to ¼ oz.; loganberry, 2 to 5¼; raspberry, 3½. When cooked by boiling the figures are: black currant, ½ to 1 oz.; brussel sprout, 2¼ to 4; asparagus, 2¾ to 5; spinach, 2 to 8¼; gooseberry, 3¾ to 7; loganberry, 4 to 4; new potato, 4¼ to 5¾. The Bramley's seedling apple, raw or cooked, is an excellent source of vitamin C.

Vitamin D.—Few foods are a good source of vitamin D, and concentrates may be necessary. Milk does not exceed 50 units per pint, and may be as low as zero. Butter runs from 10 to 100 units per oz. (Empire butter has the highest figures.) Egg yolk runs from 30 to 100 units per yolk. The body oil of the fat fishes has a high value, and fish livers a still higher value. Cod-liver oil may have a value as high as 1,000 units per teaspoonful, and halibut-liver oil 40 to 80 units per drop.

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ANTIMICROBIAL ACTION OF SOME AROMATIC COMPOUNDS

Writing to *Nature* of August 14th, André Girard, André Ray and Guy Richard, of the Laboratoire de Recherches des Etablissements *Roussel*, Paris, state that numerous recent researches have directed their attention to the antimicrobial action of various aromatic amino or nitro compounds containing the following functional groups: sulphamide, R—SO_2NH_2; thio, R—S—R′; dithio, R—S—S—R′; sulphone, R—SO_2—R′; thiophenol, R—SH; sulphinic acid, R—SO_2H. By chemical analogy with the arsenic compounds in which the arsenoxide group shows *in vitro* a very high parasiticidal activity, they have been led to a study of the para-substituted aromatic sulphoxides.

Experiments on mice have proved that 4:4′-diacetylaminodiphenyl sulphoxide (m.p. 292° C. uncorr.) and also other sulphoxides, symmetrical or asymmetrical, containing the groups OH, NH_2 or NO_2 in the *para*-position, administered by mouth, show an extremely high curative activity not only against *Streptococcus*, but also against experimental gonococcal infection.

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PIG CENSUS, ENGLAND AND WALES

Preliminary results of the census of pigs taken by the Ministry of Agriculture on June 4th, show that in only eight counties in England and Wales have the number of pigs increased since June, 1936. The other 44 counties all show decreases, and the total number of pigs in the United Kingdom (3,632,300) is 171,000 less than a year ago.

In the north-west, Lancashire shows a gain of 8,000 pigs, Cheshire of 3,000, and Cumberland of 1,000. In the south-east there are increases of 3,000 in Hertfordshire and 2,000 each in

Surrey and Sussex. The only other counties to record increases are Cornwall (200) and Anglesey (1,500).

The biggest decreases are in Yorkshire and Lincolnshire, which have 30,000 and 20,000 fewer pigs respectively. Somerset shows a decline of 13,000 and Devon 11,000. Decreases are also large in the West Midlands. Gloucestershire records a loss of 11,000 pigs during the year, Worcestershire and Wiltshire 8,000 each, and Shropshire and Herefordshire 7,000 each. Norfolk has 8,000 fewer pigs, and Northamptonshire 6,000 fewer.

Yorkshire, with 362,000, has the largest number of pigs, followed by Suffolk, with 232,000, Lincolnshire, with 209,000, Norfolk, with 204,000 and Cornwall, with 194,000.

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ARTIFICIAL INSEMINATION IN KENYA

A recent issue of the *Journal of Agricultural Science* contains an account of a preliminary experiment on artificial insemination of cross-bred Merino sheep in Kenya, the experiment having been carried out by Dr. James Anderson, M.R.C.V.S., of the Division of Veterinary Research, Experimental Station, Naivasha. The paper shows that 202 ewes inseminated gave a lambing percentage of 74·3 from one pure-bred Merino ram. The total number of live lambs, dead lambs and foetuses gave a percentage of 93·1. The results are regarded as comparing very favourably with natural insemination as regards the class of ewes used, and in future it is intended to keep one pure-bred ram of a good type, which will replace about 18 rams. In the event of an export trade for mutton being developed, it is stated, there is the possibility of crossing native sheep with rams of mutton breeds, but this would have to be carried out in relation to the available plane of nutrition.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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COMPULSORY PASTEURISATION

To the Editor of the Veterinary Record

Sir,—Colonel Wakefield Rainey's letter in your issue of August 28th concerns the attitude of the *Veterinary Record* towards the compulsory pasteurisation of milk. In the writer's submission, this journal has rightly interpreted the views now held by workers who are competent to pass judgment on this matter. They are simply as follows. First, there is a danger to the public health from the consumption of raw milk as produced at present in this country. What this danger is can only be properly assessed by the bacteriologist and epidemiologist, and it has been so well investigated and openly discussed that it would be trite to enlarge upon it here. Secondly, this danger derives largely from the cow. The extent to which it emanates from the cow has again been so well investigated and discussed openly by veterinarians that it would be idle to pursue the subject. But, in sum, the evidence is overwhelming that the danger from the cow is a serious one to the public health, and, moreover, disease such as endangers public health in the cow is a very serious matter in so far as it affects directly the agriculturist and dairyman.

The safeguarding of the public health is a subject which comes within the province of our sister profession. We are concerned with it only in so far as it is made plain to us that public safety is threatened by conditions we know to prevail among animals. What are the proper steps to take to combat danger *at* this source is certainly a problem that is the concern of the veterinarian, as are also the measures to be taken to safeguard the health of the animals themselves in the interest of the agriculturist. We have insisted, and still maintain, that the situation in respect of one of the dangers at the source, namely tuberculosis, is so grave and its prevalence so extensive that in the interest of the general public and of the agriculturist, drastic steps ought to be taken without delay to eradicate it. And, given the support which we have asked for repeatedly and which we are happy to find is now at last forthcoming, we are confident we can achieve the task.

But, when it comes to the protection of the public against imminent dangers *from* that source, we are bound to admit that it may be some time before the milk supply of the country generally will become innocuous as the result of our efforts. Meanwhile, the danger can only be averted by some form of heat treatment effectively to destroy the pathogenic bacteria likely to be present in it in the raw state. This kind of treatment in itself will obviously in no wise lessen the degree of contamination at the source, but it is an expedient the necessity for which it would be plainly unreasonable to contest. In many respects, the position has its parallel in the water supplies destined for human use.

Having stated these elementary propositions (with some diffidence, because they have often been perhaps better expressed by other veterinarians) it becomes simple to defend the line of policy as adopted and expressed from time to time in your journal. Compulsory pasteurization is an expedient which is necessary in the interests of public health for application to all milks from any sources that are not proved free from danger of tuberculous infection. It is when this expedient is construed as a wholly satisfactory alternative—as it has often been in the past—to drastic eradication of the danger at its source that the weight of well-informed veterinary opinion must be thrown against it. And, in this, the course of action for long urged by your journal has been a correct interpretation of this opinion, and, it seems to me, its present attitude, in the face of the changed trend of outside policy, shows no inconsistency.

Part of Colonel Rainey's letter relates to his subjective impressions upon social questions that are outside the competence of the veterinarian for authoritative comment. They are irrelevant and, therefore, do not require further consideration.

Yours faithfully,
J. T. Edwards.

Woodlands,
Sheets Heath,
Brookwood.

August 28th, 1937.